



Forestry and
Land Scotland
Coilltearachd agus
Fearann Alba

Central Region

Gartmorn Forest Land Management Plan 2023-2033 Main Document



Plan Reference No: LMP/04/2023

Plan Approval Date: 10/08/2023

Plan Expiry Date: 10/08/2033

We manage Scotland's National Forest Estate to the United Kingdom Woodland Assurance Standard – the standard endorsed in the UK by the international Forest Stewardship Council® and the Programme for the Endorsement of Forest Certification. We are independently audited.

Our land management plans bring together key information, enable us to evaluate options and plan responsibly for the future. We welcome comments on these plans at any time.



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Land Management Plan Details

LMP Name:	Gartmorn Forest		
Main Forest Grid Reference:	NS 9138 9544	Nearest town or locality:	Sauchie
Nearest Post code:	FK10 3AU		
Local Authority:	Clackmannanshire		
Land Management Plan area (hectares):	72.39		

Owner's Details

Title:	Mrs	Forename:	Carol
Surname:	McGinnes		
Organisation:	Forestry and Land Scotland	Position:	Regional Manager
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Table 1 Version History

Version	Date	Comments
0.0	06/02/2023	Submission to Scottish Forestry
0.1	12/06/2023	Consultation feedback and responses added to Appendix IV.
0.2		
1.0		
1.1		
1.2		
1.3		
1.4		
1.5		
1.6		



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1.0 Summary of Proposals

1.1 Plan Overview

This Land Management Plan (*LMP*) covers Gartmorn forest, an area of land covering 72.39 hectares. It was acquired by Forestry and Land Scotland in 1957.

In this LMP, Gartmorn forest is also referred to as ‘**the forest**’ or ‘**the plan area**’.

The forest is located within the County of Clackmannanshire and sits between two dramatic landforms - the Forth Estuary and the Ochil Hills (*see Map 1*).

The closest settlements to the forest are Coalsnaughton, Fishcross and Sauchie; all less than 1 km away. These small settlements link to the forest via a network of pedestrian core paths.

Forestry and Land Scotland (FLS) propose to manage the plan area as a continuous cover forest. Conifers will be removed over a period of 50 to 60 years to leave predominantly native broadleaves. During this transformation, the forest will generate a range of softwood timber products. In the longer term, native broadleaves will be managed for low output hardwood production, deemed more sympathetic to other key objectives:

- Informal recreation provision & stewardship of heritage features.
- Increasing biodiversity & native woodland connectiveness.

All sections of this digital document can be accessed through the [Table of Contents](#) (*above*) by pressing/clicking on the relevant section.

Immediately below [Section 1.2](#) lists overarching management objectives for the forest.

[Section 2.0](#) provides a summary of planned operations.

More detailed proposals for delivery are in [Section 7.0](#), this includes key woodland changes over the next 20 years - displayed as tables and charts.

A full list of this plan’s maps can be found in supporting document [Appendix V](#) - relevant maps are referred to in the text. Supporting documents [Appendix VIII](#) & [IX](#) show ground-based & aerial photos to support the plan text.

Finally, detailed background information on the forest is in supporting document [Appendix I](#). This section includes analysis of the previous plan.



1.2 Gartmorn Land Management Plan Objectives 2023-2033

- Gradually transform the forest to mainly native broadleaved woodland to enhance its contribution to the forest habitat network in Clackmannanshire.
- Protect and enhance biodiversity assets within the forest.
- Protect 'Octagon Wood' designed landscape and incorporate into forest setting.
- Manage and mitigate impacts of tree pests and diseases (*e.g. Dothistroma Needle Blight and Phytophthora ramorum*).
- Maintain existing recreational assets throughout the forest and, where feasible, continue to involve relevant stakeholders.
- Maintain productive management in the west of the forest, focusing on high quality niche broadleaved production in the long-term.
- Improve management access to facilitate delivery of the plan.



1.3 UK Woodland Assurance Indicators of Proposed Plan

Table 2

UKWAS indicator	Description	Area (ha)	% of Plan Area
Total LM Plan Area	Total land area within plan boundary	72.39	
Total Current Woodland Area	Sub-cmpts with total trees in the sub-cmpt greater or equal to 20%: High forest (PHF), Windblow (PWB), Partially Intruded Broadleaves (PIB), Seed Stand (PSS), Seed Orchard (FMS), Research Plantation (PRP), Ancient and Ornamental (NAO), Arboreta (NAR), Worked coppice (PWC), Christmas trees (FMC), Felled (PFE) and Burnt (PBU).	65.19	90.05
Natural Reserves - Plantation	N/A	0	0
Natural Reserves - Semi-natural	Coupe 11001	19.09	26.37
Long-term retention and areas managed under LISS* and Minimum Intervention	Management coupes of type Group shelterwood, Irregular shelterwood , Uniform shelterwood, Group selection, Single tree selection, Strip shelterwood, Long-term Retention , Coppice with Standards, Pollarded coppice, Coppice, Minimum Intervention (Natural Reserve) , Minimum Intervention. UKWAS requires at least 1% of the Woodland Management Unit	58.20	80.40
Area of Conservation value	Long-term retention coupes (14.80ha) & minimum intervention (natural reserve) areas (21.37ha)	35.90	49.59
Planned Open/Other	Derived from the Future Habitats & Species (Managed Open and Open Successional)	6.88	9.50

* LISS = Lower-impact silvicultural systems¹ or Continuous Cover² management.

¹The term 'lower-impact silvicultural systems' (LISS) is defined by the UK Woodland Assurance Scheme as silvicultural systems including group selection, shelterwood or underplanting, small coupe felling, coppice or coppice with standards, minimum intervention and single tree selection systems which are suitable for wind-firm conifer woodlands and broadleaved woodlands.

²Continuous cover forestry falls within the wider definition of LISS and involves the maintenance of a forest canopy during the regeneration phase with a consequent presumption against clearfelling in favour of alternative silvicultural systems.



2.0 Scottish Forestry Regulatory Requirements

All proposals have been produced in accordance with a range of government and industry standards as well as recent research outputs. A full list of current standards and guidance can be found [here](#)

2.1 Summary of Planned Operations

Table 3 Summary of Planned Operations

Planned Operations 2023-2033	Area
Clearfell/Clearfell with seed tree (afforested area)	8.05 hectares
LISS felling	0.85 hectares
Commercial thinning areas	14.54 hectares
Pre-commercial productive broadleaved & amenity thinning	8.66 hectares
Low intensity thinning in for environmental purposes in predominantly broadleaved stands (<i>veteran broadleaved halo thinning, conifer removal, public and neighbour safety</i>).	15.92 hectares
Total Thinning Area:	39.12 hectares
Restock	8.05 hectares
LISS Restock	0.85 hectares
Road Construction	670 metres
Road Upgrade	140 metres



2.2 Proposed felling in years 2023-2033

More detailed prescriptions for clearfell and LISS felling are provided in [Section 7.5 & 7.6](#) (*Management Proposals*).

[Maps 14a](#) and [14b](#) show felling areas broken down into 5 year felling 'Phases'. All felling detailed below is proposed for Phase 1 (2023-2027).

Clearfelling gross area for plan period = 9.53 hectares

Clearfelling net area for plan period (net of retained broadleaves) = 8.05 hectares

Total estimated clearfell volume = 3232 m³

Total estimated clearfell tonnage = 2993 tonne

LISS felling* net area = 0.85 hectares

Total estimated clearfell volume = 351 m³

Total estimated clearfell tonnage = 325 tonne

(This intervention will comprise clearance of existing small pockets of windblow **only – see [Section 7.6](#) for rationale.)*

The total net area of proposed felling as a percentage of the plan area is **12.29%**.

A breakdown of felling areas is shown below in [Tables 4 & 5](#) (*below*).



Table 4 Clear felling

Clearfelling Phase 1 (2023-2027)

Coupe Ref	Proposed FY Year	Gross Area (ha)	Net Area (ha)	Original Planting Year	Scots pine (net ha)	Larch (net ha)	Western hemlock (net ha)	Norway spruce (net ha)	Windblow (net ha)	Open (net ha)	Retained broadleaves (ha)	% LMP area (net)	Estimated Total Volume m ³
11006	2025-26	6.84	6.09	1950, 1961, 1962	2.76	0.37	0.65	1.57	0.57	0.17	0.75	8.41%	2510
11007	2025-26	2.69	1.96	1961	1.06			0.72	0.10	0.08	0.73	2.71%	722
Totals		9.53	8.05		3.82	0.37	0.65	2.29	0.67	0.25	1.48	11.12%	3232

Table 5 LISS felling

LISS felling Phase 1 (2023-2027)

Coupe Ref	Proposed FY Year	Gross Area (ha)	Net Area (ha)	Original Planting Year	Scots pine (net ha)	Larch (net ha)	Western hemlock (net ha)	Norway spruce (net ha)	Windblow Scots Pine (net ha)	Open (net ha)	Retained broadleaves (ha)	% LMP area (net)	Estimated Total Volume m ³
11004	2025-26	0.85	0.85	1961					0.85			1.17%	351



2.3 Proposed thinning in years 2023-2033

The different types of thinning prescriptions proposed are detailed in the Management Proposals [Section 7.7 Thinning](#). Also see supporting [Map 15](#) which shows areas proposed for both commercial and non-commercial thinning. Commercial thinning is most likely to be completed at the same time as clearfelling operations detailed above in [Section 2.2](#).

Table 6 Proposed Thinning Breakdown by forest species over LMP period

Thinning by Forest Species (Area in Hectares)	
Tree species	Area (ha)
Scots Pine	12.71
Norway spruce	0.71
Douglas fir	0.56
Grand fir	0.29
Western Hemlock	0.26
Broadleaves	24.59
Total Area	39.12

Table 7 Proposed Thinning Breakdown by objective over LMP period

Thinning Objective	Management Coupe Ref	Area (ha)
Commercial Conifer Thinning	11004 & 11003 (north part)	14.54
Pre-commercial productive broadleaved & amenity thinning	11005	8.66
Conservation/amenity/safety in Long-term Retentions (<i>low intensity thinning for environmental purposes in predominantly broadleaved stands - veteran broadleaved halo thinning, public and neighbour/utility safety</i>).	11002, 11003 (south part) & 11009	15.92
Total Thinning Area		39.12

The expected volume to be commercially removed (*including existing windblow*) during the LMP period is approximately 522m³ or 483 tonnes.



2.4 Proposed restocking in years 2022-2032

Restock in clearfell coupes (*Phase 1*):

9.53 hectares gross

8.05 hectares net (*net of retained broadleaved areas*)

Restock LISS felling areas (*Phase 1*):

0.85 hectares (net)

A breakdown of restocking by coupe is provided below in [Tables 8 & 9](#)

See supporting [Map 17 Future habitats and species](#)

See [Section 7.11 Restock Proposals](#) for more detailed specifications.

[Table 8 & 9](#) Reference Notes:

1. See FC Bulletin 112 Creating New Native Woodlands for recommended NVC species planting mixtures.
2. SDA = Stocking Density Assessment for both planting and natural regeneration areas at year 1 and year 5 growing years



Table 8 - Phase 1 (2023-2027) Restocking of clearfelled areas (hectares)

Coupe Number	Total Area (ha)	Sessile Oak planting (ha)	Wild Cherry planting (ha)	Aspen planting (ha)	Hazel planting (ha)	Open (ha)	Native mixed broadleaves natural regeneration (ha)	¹ NVC Type	Restock year	Description, Restock Method & Density (Restock/Nat Regen/Alt Area/Coppice/Open)	Monitoring Comments
11006	6.09	0.17	0.02	0.02	0.02	0.17	5.69	W11	2025-26	<p>Manual screef & direct/flat plant W11 native broadleaves at 10m - 15m centres in tubex guards in the following proportions: Sessile oak 70%, Aspen 10%, Rowan 10%, Hazel 10%. This planting is to cover the whole site but will make up approximately 4% of the plantable area (assuming total target stocking density of 1,600/ha).</p> <p>Remaining matrix allowed to fill in with broadleaved naturally regeneration (mainly birch) - as has occurred in previous felled areas (e.g. management coupe 11005). Pre-commercial respacing once crop established (>year 5). Any conifer natural regeneration to be reduced to 10% of area, removing all Western hemlock as a priority.</p>	SDA ²
11007	1.96	1.31	0.19	0.19	0.19	0.08		W11	2025-26	<p>Low impact cultivation & planting. W11 Upland Oak/Birch Woodland 1600 stems/ha (2.5m x 2.5m)</p> <p>Lower potential for natural regeneration in this coupe so 100% restock planting to be undertaken in following species proportions (intimate mixture): Sessile oak 40%, Birch 30% Aspen 10%, Rowan 10%, Hazel 10%.</p>	SDA ²
Totals	8.05	1.63	0.23	0.23	0.23	0.25	5.69				



Table 9 - Phase 1 (2023-2027) Restocking of LISS felled areas (hectares)

Coupe Number	Total Area (ha)	Sessile Oak planting (ha)	Wild Cherry planting (ha)	Aspen planting (ha)	Hazel planting (ha)	Open (ha)	Native mixed broadleaves natural regeneration (ha)	¹ NVC Type	Restock year	Description, Restock Method & Density (Restock/Nat Regen/Alt Area/Coppice/Open)	Monitoring Comments
11004	0.85	0.0245	0.0035	0.0035	0.0035	0	0.82	W11	2025-26	<p>Manual screef & direct/flat plant W11 native broadleaves at 10m - 15m centres in tubex guards in the following proportions: Sessile oak 70%, Aspen 10%, Rowan 10%, Hazel 10%. This planting is to cover the whole site but will make up approximately 4% of the plantable area (assuming total target stocking density of 1,600/ha).</p> <p>Remaining matrix allowed to fill in with broadleaved naturally regeneration (mainly birch) - as has occurred in previous felled areas (e.g. management coupe 11005). Pre-commercial respacing once crop established (>year 5). Any conifer natural regeneration to be reduced to 10% of area, removing all Western hemlock as a priority.</p>	SDA ²
Totals	0.85	0.0245	0.0035	0.0035	0.0035	0.00	0.82				



2.5 New Forest road requirements 2023-2033

Table 10 forest road requirements 2023-2033

(See Map 14a management coupes & Map 16 access & proposed forest roads)

Planned forest road requirements 2022-2032					
Coupe Number	Type	Total length (metres)	Total Area (hectares)	Rationale	Monitoring Comments
11004 & 11006 (NS 9108 9500)	New spine road with turning point	630	0.63	This new infrastructure is to provide future timber haulage access to the west of plan area. The 630 metres includes a 50 metre turning point to be placed at western end of the new road so that lorries do not have to turn on private access road - which currently serves residential and business interests. Roadline felling and windblow clearance will be required along the line of the road.	GIS Planned road layers (ForesterWeb)
11004, 11006, 11007 11008 (NS 9081 9483)	Track upgrade for machine access	140	0.084	The existing track will be upgraded from the western end of the new forest road to coupe 11007. This will allow forest machine access for timber harvesting & extraction. A small amount of felling will be required to widen/upgrade the track.	GIS Planned road layers (ForesterWeb)
11006 Gartmorn Farm access road (NS 9145 9483)	Installation of layby	40	0.04	Temporary installation of layby at west side of private farm access track to allow roadside timber loading for Pine/Larch stand in coupe 11006. A few existing trees may require felling to make safe adjacent to layby.	GIS Planned road layers (ForesterWeb)
Multiple Coupes	Maintenance/ Reinstatement Post Harvesting	770	N/A	Post harvesting maintenance work: 1. Maintenance of the new road to safely connect to & provide a similar level of access provision to existing path network. 2. Reinstatement of the 140 metre path section upgraded for machine access to coupe 11007. 3. Installation of entrance security infrastructure to restrict unauthorised vehicle access (complying with SOAC guidelines)	GIS Planned road layers & recreation linear assets layers



The new road infrastructure will serve the following purposes:

1. Allow management access to remove isolated conifer stands in the south & west of forest - for subsequent conversion to broadleaves.
2. Avoid HGV timber haulage through Alloa golf course and onto the A908 - in Sauchie.
3. Reduce operational conflict by keeping the majority of HGV turning & timber loading away from the farm/residential access road serving Gartmorn Farm.
4. Reduce forest machine working distances - to minimise impacts on hydrology & soils.
5. Provide long-term access to broadleaved stands in the west of the forest – to be managed using continuous cover forestry practices.

See [Section 7.14 Operational Access](#) for more detail.

2.6 Departure from UKFS guidelines

All operations will be conducted in accordance with Forest Industry Best Practice Guidance and the UK Forestry Standard.

2.7 Standards and guidance on which this LMP is based

This land management plan has been produced in accordance with a range of government and industry standards as well as recent research outputs. A full list of these standards and guidance can be found here: <https://forestryandland.gov.scot/what-we-do/planning/links>



2.8 Tolerance Table

Table 11 Regulatory tolerances for changes to the approved land management plan

Action Required	Map Required (Y/N)	Adjustment to felling period	Adjustment to felling coupe boundaries	Timing of restocking	Change to species	Wind throw response	Adjustment to road lines	Designed open ground
Scottish Forestry (SF) Approval not normally required (record and notify SF)	N	Fell date can be moved within 5 year period where separation or other constraints are met	<10% of coupe size.	Up to 5 planting seasons after felling (allowing fallow periods for <i>Hylobius</i>).	Change within species group E.g. Scots pine to birch, Non-native conifers e.g. Sitka spruce to Douglas fir, Non-native to native species (allowing for changes to facilitate Ancient Woodland policy).			Location of temporary open ground e.g. deer glades if still within overall open ground design Increase by 0.5 ha or 5% of area - whichever is less
Approval by exchange of letters and map	Y		10-15% of coupe size.	5 years +	Change of coupe objective that is likely to be consistent with current policy (e.g. from productive to open, open to native species).	Up to 5 Ha	Departures of greater than 60 m from the centre of the road line	Increase of 0.5 ha to 2 ha or 10% - whichever is less Any reduction in open ground
Approval by formal plan amendment may be required	Y	Felling delayed into second or later 5 year period. Advance felling into current or second 5 year period.	>15% of coupe size.		Major change of objective likely to be contrary to policy, E.g. native to non-native species, open to non-native,	More than 5 Ha	As above, depending on sensitivity	More than 2 ha or 10% Any reduction in open ground in sensitive areas Colonisation of open Areas agreed as critical



Forestry and Land Scotland's Larch Strategy

The management of larch and controlling the spread of *Phytophthora ramorum* relates to the revised [Scottish Forestry *Phytophthora ramorum* action plan](#) published in June 2021. Gartmorn falls within the 'Priority Action Zone' and, under the FLS Larch Strategy, the aim is to undertake preparatory planning for sites. This LMP proposes the removal of larch from the forest. Further tolerances have been applied for areas of larch requiring felling under Statutory Plant Health notices in other areas of Scotland. However felling to remove larch from Gartmorn forest under this LMP should offset the need for additional tolerances.

Restocking Options.

Where larch is to be felled, Scottish Forestry guidance for the selection of suitable replacement species will be followed.

In landscape terms the replacement of larch with native broadleaves is deemed appropriate in terms of softening visible margins and maintaining visual diversity.



3.0 Environmental Impact Assessment (EIA) Screening Determination for forestry projects

Table 12 Proposed work that may require Screening determination for EIA

Proposed Work							
<i>Please put a cross in the box to indicate the type of work you are proposing to carry out. Give the area in hectares and where appropriate the percentage of conifers and broadleaves</i>							
Proposed Work	Select (X)	Area (ha)	Conifer	Broad-leaves	Proposed work	Select (X)	Length (m) Area (ha)
Afforestation					Forest roads (incl. upgrades)	X	810 0.81
Deforestation					Forest quarry		
Location of work	New forest spine road 630m (NS 9108 9500) Forest road upgrade 140m (NS 9081 9483) Temporary layby 40m (NS 9145 9483)						

3.1 Proposed deforestation

N/A

3.2 Proposed forest road works

810 metres as detailed in [Section 2.5](#) and [Section 7.14](#)

This is below the 1 hectare Screening Opinion Request threshold.

3.3 Proposed forest quarries

N/A

3.4 Proposed afforestation

N/A



4.0 Introduction

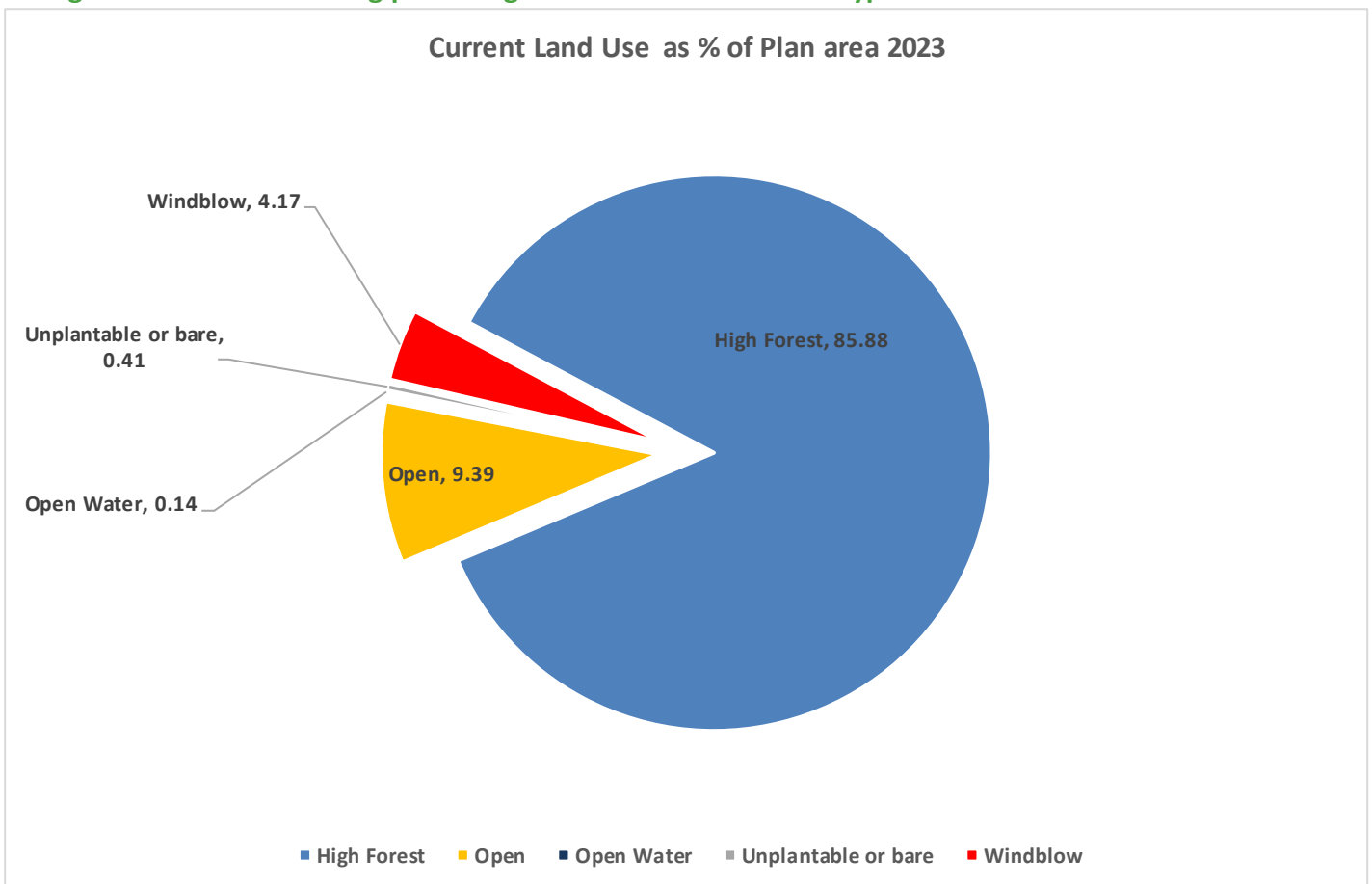
4.1 The existing land holding

The plan area covers 72.39 hectares.

Table 13 Area and Percentage Breakdown of Land Use Type within Gartmorn

Land Use Type	Area (ha)	% of LMP area
High Forest	62.17	85.88
Open	6.80	9.39
Open Water	0.10	0.14
Unplantable or bare	0.30	0.41
Windblow	3.02	4.17
Totals	72.39	100

Figure 1 Pie-chart showing percentage breakdown of land use type within Gartmorn





Appendix I Supporting Information contains the following information about the plan area:

- A review of the previous management plan and how it relates to today's objectives.
- Physical attributes of the forest (*soils, wind hazard, hydrology, existing and predicted future climate*).
- Analysis of forest stands (*composition, age range, growth rate, past management & options for future management*).
- Current operational access.
- Potential for low impact silvicultural systems.
- Plant health issues.
- Land-use and landscape.
- Biodiversity and conservation.
- Wildlife (*deer*) management.
- Heritage & designed landscapes.
- Stirling & Clackmannanshire Forestry & Woodland Strategy.
- Social factors and recreation.

This information is supported by the following LMP maps:

- [Map 1](#) Location & context.
- [Map 2](#) Existing forest stands.
- [Map 3](#) Landform & hydrology.
- [Map 4](#) Wider landscape setting
- [Map 5](#) Site constraints & sensitive features
- [Maps 6,7 & 8](#) Native woodland characteristics & deadwood potential
- [Map 9](#) Non-motorised path networks & visitor zones
- [Maps 10 & 11](#) Ground-based & aerial photo locations

Photos of the forest can be found in the following appendices (*supported by [Map 10 & 11](#)*):

- [Appendix VIII](#) Ground-based photo viewpoints
- [Appendix IX](#) Aerial Photos



4.2 Setting and Context

The forest is located within the County of Clackmannanshire and sits between two dramatic landforms - the Forth Estuary and the Ochil Hills range (see [Map 1](#)).

Settlement location around the forest is shown on [Map 1](#). Although the plan area does not immediately border an urban area, several small settlements sit within 1 kilometre of the forest boundary. These are Coalsnaughton, Fishcross and Sauchie. They have a combined population of about 7,800 residents. Alloa town, with about 20,000 residents, joins directly to Sauchie to form a larger urban zone to the south-west. Tillicoultry with 4,600 residents closely borders Coalsnaughton to the north.

These urban areas connect to the forest via a network of pedestrian core paths. This extensive path network connects the forest and surrounding settlements to a nearby Country Park based at Gartmorn Dam Reservoir – to the south.

The forests’ main management access is from the B9140. This minor road links to a number of A class roads – the A908 and A977. The closest motorway is the M876, approximately 12 miles away, which promptly links to the M9.

The plan area forms part of the Local Landscape Area called ‘The Forest’. It is also located within the Central Scotland Green Network (CSGN) boundary and delivers toward several objectives in the CSGN Delivery Plan. [Table 14](#) lists these objectives.

Table 14 How this plan contributes to the Central Scotland Green Network Project

Ref	Objective	Linked Primary Workstream(s)
<i>Biodiversity and ecological coherence</i>		
HA5	Increase the quality/condition of habitats	Natural Climate Solutions. Placemaking.
HA6	Increase habitat connectivity	Natural Climate Solutions. Placemaking.
<i>Green Infrastructure</i>		
GI2	Increase the quality and functionality of greenspaces within the CSGN	Natural Climate Solutions Placemaking Health and Wellbeing Green Recovery
GI3	Increase use of the CSGN by people living and working in Central Scotland	Placemaking Health and Wellbeing Green Recovery



5.0 Plan objectives

Appendix I, Sections 2 & 3 provides an analysis of the previous plan and progress to-date in meeting its objectives.

Section 1.2 lists the updated management objectives for this Land Management Plan. These were agreed at an internal scoping meeting held with Forestry and Land Scotland local delivery staff in October 2021. Comments from this meeting were collated alongside detailed desk and site surveys, and feedback from key stakeholders. The information gathered during this process was then used in the **Analysis & Concept** process (*see below*) to generate specific management prescriptions outlined in **Section 7.0 Management Proposals**.

Section 9.0 - **Objective, Appraisal, Monitoring & Evaluation** shows how each overarching management objective will be appraised, where and when it will be monitored, where this will be recorded and the responsible team for implementing these tasks. This will enable an evaluation of success as part of the 5 year mid-term review and 10 year plan renewal.

6.0 Analysis and Concept

The 'Analysis' process illustrates how information gathered was evaluated to identify important features, constraints and opportunities within the forest. This allowed the formation of management 'concepts' or general strategies from which more detailed management prescriptions were produced (**Section 7.0 Management Proposals**). The analysis and subsequent concept process is summarized in **Table 15** (*below*). The first two columns in this table detail the analysis process (*constraints & opportunities*). The third column details the concept or strategy developed from each specific constraint and opportunity. The text in blue highlights related overarching management objectives of the plan.

6.1 Analysis

The analysis is used to identify key features, constraints and opportunities within the forest. In addition to **Table 15**, a schematic representation of this process is shown in **Map 5 site constraints & sensitive features** and more specifically **Map 12 analysis of constraints and opportunities**.

6.2 Concept

The concept design process used constraints and opportunities identified during Analysis to generate management concepts or strategies going forward. In addition to **Table 15**, a schematic representation of this process is shown in **Map 13 Concept Design**.



Table 15 – Concept development through analysis of constraints and opportunities

Constraints/Challenges	Opportunities	Concept
Linked Overarching Management Objectives		
<p>Within western zones of the forest there exist earth bank features which are remnants of a much larger 18th Century formal designed landscape conceived by John Erskine 6th Earl of Mar for his Alloa Estate. Although not Scheduled or registered in Historic Environment Scotland’s Inventory of Gardens and Designed Landscapes, it is recognized in this plan that strong consideration should be given to their protection and linear/geometric design.</p>	<p>Opportunity to design and locate required forest management infrastructure in keeping with the formal style of these features. Opportunity to use techniques such as LIDAR mapping to generate additional information on their condition and existing breakpoints or gaps in these features. This information can be used to better inform management operations.</p>	<p>See Map 18 (heritage features & new forest road). This map shows the proposed design of new road infrastructure in relation to the earth banks forming ‘Octagon Wood’ heritage feature.</p>
<p>Protect ‘Octagon Wood’ designed landscape and incorporate into the forest setting. Maintain existing recreational assets throughout the forest and, where feasible, continue to involve relevant stakeholders. Improve management access to facilitate delivery of the other plan objectives.</p>		
<p>The plan area forms part of a connected network of native woodland, core paths, local and national conservation sites and informal recreation resources for local communities.</p>	<p>Opportunity to improve connectivity of native woodland and move towards lower output broadleaved management systems. Opportunity to maintain and enhance ecological characteristics of plan area such as deadwood levels, structural diversity, native species & woodland field layers. In the long-term this should enhance visitor experience and opportunities for forest education and informal exercise.</p>	<p>See Map 13 (concept design):</p> <p>Gradually reduce conifers over next 50 years to a level of ~10%. Restock with W11 Oak / Birch Woodland. Retain and create deadwood habitat & veteran (old growth) trees where safe to do so.</p> <p>Timber production will move from high output softwood (conifer) production to lower output hardwood production (both high quality sawlogs & firewood).</p> <p>Maintain minimum intervention natural reserve whilst allowing some amenity thinning / enhancement work immediately adjacent to well-used path networks.</p> <p>Existing path networks to be maintained, FLS to continue working with partners to improve opportunities for informal recreation and outdoor education.</p>



Constraints/Challenges	Opportunities	Concept
Linked Overarching Management Objectives		
<p>Gradually transform the forest to mainly native broadleaved woodland to enhance its contribution to the forest habitat network in Clackmannanshire.</p> <p>Protect and enhance biodiversity assets within the forest.</p> <p>Maintain existing recreational assets throughout the forest and, where feasible, continue to involve relevant stakeholders.</p> <p>Maintain productive management in the west of the forest, focusing on high quality niche broadleaved production in the long-term.</p>		
<p>Harvesting operations in the woodland continue to be challenging due to:</p> <ul style="list-style-type: none"> • Haulage & machine access constraints. • Older conifer blocks in the south & west increasingly isolated from transfer points. • High risk utilities scattered throughout the forest. • Heritage and recreation features within the forest. 	<p>Opportunity to target removal of more isolated conifer stands & restock with native broadleaves.</p> <p>Opportunity to improve internal forest road access in order to reduce machine extraction Distances & potential soil compaction. This in-turn will help reduce operational conflict with forest users, neighbours & local businesses.</p> <p>Opportunity to remove Larch & potential for spread of <i>Phytophthora ramorum</i></p>	<p>See Map 13 (concept design) & Map 14 (felling plan):</p> <p>In western half of the plan area over next ten years fell isolated, unthinned conifer stands and mixed conifer stands with Larch present. Restock with W11 Oak / Birch woodland. Removal of these stands will reduce future conflict with utilities infrastructure & visitor zones. It will also reduce potential windblow over march boundaries and into neighbouring land.</p> <p>See Map 16 (proposed roads): Create new forest road infrastructure to improve long-term management access throughout western half of the plan area. In the longer term, this will allow lorry turning, timber stacking and loading away from the busy residential access road and reduce the need to use alternative less suitable access routes such as through Alloa golf course.</p> <p>Regeneration of native stands and more diverse age and canopy structures across the forest are hoped to reduce high levels of windblow during severe storm events.</p>
<p>Gradually transform the forest to mainly native broadleaved woodland to enhance its contribution to the forest habitat network in Clackmannanshire.</p> <p>Improve management access to facilitate delivery of the plan.</p> <p>Protect 'Octagon Wood' designed landscape and incorporate into the forest setting.</p> <p>Manage and mitigate impacts of tree pests and diseases (e.g. Dothistroma Needle Blight and <i>Phytophthora ramorum</i>).</p>		
<p>Substantial windblow throughout conifer</p>	<p>Opportunity to clear windblow throughout forest,</p>	<p>See Map 14 (felling plan) & Map 15 (thinning plan):</p> <p>In western half of forest, clear windblow in next plan period. In thinned p1961 pine stands this will</p>



Constraints/Challenges	Opportunities	Concept
Linked Overarching Management Objectives		
<p>areas mainly resulting from Storm Arwen.</p>	<p>unlock wider path network but also retain some fallen & standing deadwood resource. Opportunity to continue thinning stands in the west of the forest to improve resilience to wind and options for continuous cover forest management, improve internal views & visibility along path networks.</p>	<p>substitute as a heavy thinning intervention (See Appendix VIII aerial photos). In more isolated unthinned conifer stands in the south-west of the plan area, this will be implemented as part of the clearfell proposals (coupe 11006 & 11007). Some standing and fallen deadwood will be retained with a focus, but not exclusively, on broadleaves. In order to increase individual tree stability, younger broadleaved stands in western half of forest will be pre-commercially thinned. Proposed long-term retentions will also be thinned, where practical, to gradually revert to broadleaved woodland. Clearfelled areas will be restocked as native broadleaved woodland which has generally displayed greater resilience to severe storm events.</p> <p>Through continued, well timed thinning interventions and diversification of the forest age structure it is hoped to increase future management options, particularly under CCF, whilst improving long-term forest resilience.</p>
<p>Maintain productive management in the west of the forest, focusing on high quality niche broadleaved production in the long-term.</p> <p>Gradually transform the forest to mainly native broadleaved woodland to enhance its contribution to the forest habitat network in Clackmannanshire.</p> <p>Protect and enhance biodiversity assets within the forest.</p>		
<p>The plan area forms an important component of views looking north from Gartmorn Dam Country Park & the core path network.</p>	<p>Opportunity to gradually move towards lower intensity management systems with less visual impacts after felling. Opportunity to gradually transform forest to native species which will blend in more sympathetically with surrounding woodland from key viewpoints.</p>	<p>See Map 10 (viewpoints) & Appendix VII (photos): Felling of isolated conifer stands and clearance of windblow during the plan period will have some impact on key viewpoints from the Country Park but will be mitigated by screening from surrounding woodland – for example Cowpark Wood and riparian woodland just to the north of Gartmorn Dam reservoir. The long-term transformation of the plan area to native broadleaved lower intensity management will be accompanied by smaller scale felling and more diverse age structures, reducing future landscape impacts of forest operations.</p>



Constraints/Challenges	Opportunities	Concept
Linked Overarching Management Objectives		
Gradually transform the forest to mainly native broadleaved woodland to enhance its contribution to the forest habitat network in Clackmannanshire.		



7.0 Long-term Management Plan Proposals and Prescriptions

7.1 Management Summary

Note: All proposals have been developed in accordance with sound silvicultural and environmental principles, falling within the framework outlined by the UK Forestry Standard, the UK Woodland Assurance Scheme, FC Bulletin 124 Ecological Site Classification for Forestry, FC Bulletin 115 Alternative Silvicultural Systems to Clearcutting in Britain and the current FC edition of Forest & Water Guidelines. A full list of current standards and guidance can be found [here](#)

Key challenges the management proposals have focused on:

- Plant health and controlling the spread of a damaging plant disease - *Phytophthora ramorum* in Larch.
- Improving forest access to enable long-term sustainable management.
- Clearance of windblow caused by Storm Arwen.
- Maintaining recreational infrastructure and associated visitor zones.
- Managing heritage features sympathetically - in keeping with their original design.
- Maintaining and improving native woodland connectivity and associated ecological characteristics.
- Restricting unauthorised vehicles and associated anti-social behaviour.
- Creating more diverse & attractive woodland structures, particularly around visitor zones.

Management proposals for the first five years of this plan will see the greatest changes to the forest environment:

- Road infrastructure will be installed.
- Unthinned and partly windblown conifer stands in the south and west of the forest will be clearfelled (*Coupes 11006 & 11007*).
- Windblown stems in the north-western pine stands will be cleared during a LISS thinning & LISS felling intervention (*Coupe 11004*).

The net felling area in this land management plan will be 8.9 hectares or ~12.3% of the plan area. This will comprise 11.12% clear fell and 1.17% LISS felling (*Low Impact Silvicultural Systems*).

Felled areas will be restocked with native broadleaves using a mix of natural regeneration and supplementary planting.

After clearfelling of coupes 11006 and 11007, the plan area will be managed as a continuous cover forest. Remaining thinned conifer stands will be removed over 50 to 60 years, through LISS management, to leave predominantly native broadleaves. During this transformation, the forest



will generate a range of softwood timber products. In the longer term, native broadleaves will be managed for low output hardwood production, deemed more sympathetic to other key objectives:

- Informal recreation provision.
- Stewardship of heritage features.
- Increasing biodiversity & native woodland connectiveness.

7.2 Health and safety considerations

In the drafting of this plan, consideration has been given to improving safety during and after operations:

- The removal of unstable conifer stands along paths, utilities infrastructure and legal boundaries.
- Replanting further back from the above assets.
- Removal of conifer windblow in Phase 1 of the plan.
- Installation of road infrastructure to reduce operational conflict on the shared access road & reduce long-term machine extraction distances.
- Upgrade of existing tracks for safe crossing of underground/overhead utilities during forest operations.

It is expected there will be more motor-manual working in the long-term, as the forest is worked as a productive broadleaved woodland. FLS is at the forefront of testing lower vibration electric felling tools and it is hoped by the time the forest is managed fully for broadleaved timber output, electric chainsaws and clearing saws will be the default felling tool.

7.3 Operational controls for designed landscape heritage features

This feature is also known as ‘Octagon Wood’ and described on the ForesterWeb heritage layers as ‘designed landscape bankings’. It is located in the western half of the forest (*shown on Map 5, Map 18 & Appendix VII*). The main ground features are linear earth banks approximately 1 metre high by 1.5 metres wide. These form a central octagon feature near the western boundary of the plan (*now containing the covered reservoir*). Linear avenues or pairs of parallel earth banks extend outwards from this central octagon at regular geometric intervals (*like the spokes of a wheel*) terminating at smaller circular/octagonal features.

Standard procedure used for the protection of the designed landscape earth bank features:

- Marking of features on the ground using high visibility tape prior to those operations with potential to damage these features
- Specific contract conditions applied to protect these features from damage.



- Agreement of fixed crossing points over the features using existing gaps in the earth banks.
- Careful delimiting and removal of fallen or leaning tree stems lying over or growing on top of the earth banks.
- Supervision and monitoring to ensure the above is followed.

7.4 Tree health

Ash dieback (*Hymenoscyphus fraxineus*)

This disease is present across Scotland and management efforts are now focused on mitigating safety risks from diseased trees rather than controlling the spread of the disease. It is also deemed acceptable to allow for natural regeneration of Ash, as potentially disease-tolerant or resistant trees may develop.

Scottish Forestry has commissioned the Tree Council to help support organisations across Scotland and in June 2021 the Tree Council produced an 'Ash Dieback Action-Plan Toolkit for Scotland' to help support landowners, consultants, practitioners and land managers in dealing with the risks posed by dead or dying trees near public roads and forest tracks. FLS has now integrated this guidance into its strategic level Ash Action Plan and its annual tree safety inspections.

Ash forms a very small component of forest stands at Gartmorn (~0.4%), its main concentration is at the eastern corner of the plan area (See [Map 2 Existing forest](#)). At this location a well-used core path connects to Gartmorn Dam Country Park which, in terms of public safety, makes it a priority area for annual tree inspections.

Where FLS inspections identify a need for pre-emptive felling, this will be implemented to Scottish Forestry and NatureScot guidance.

Phytophthora ramorum (P. ramorum)

Larch currently makes up a small proportion of the plan area (~0.5%) and is present mainly in mixture with Scots pine. There have been no recorded incidence of the disease so far but the forest sits within the 'Priority Action Zone' of Scottish Forestry's 'Phytophthora ramorum larch Action Plan'. This zone is where actions will have the greatest impact on controlling the spread of P. ramorum.

The main concentration of larch is proposed for removal as part of felling coupe 11006 in the first five years of this plan. Remaining larch in the plan area is present as either single scattered trees or small groups of trees within mixed stands. Both can be removed quickly by motor-manual felling if P. ramorum is identified. All restocking of cleared Larch areas will use native



broadleaves with any Larch natural regeneration being removed as part of programmed pre-commercial thinning work.

Dothistroma Needle Blight (DNB)

DNB causes premature needle defoliation, resulting in loss of yield and, in severe cases, tree mortality, particularly in many Pine species. DNB is prevalent in the north-western p1961 Scots pine stands which are currently under LISS management (*coupe 11004*).

Over the next 20 years removal of pine through clearfelling (*coupes 11006 & 11007*), LISS felling & thinning will reduce its presence from ~24% to ~15% of the forest area. Remaining pine will be present in either LISS or long-term retention management coupes, where the intention is to reduce the conifer component to 10% over the next 60 years. It is hoped the effect of thinning in these stands will help reduce the severity of the disease (*by increasing airflow*), but it is reasonable to expect a small decrease in productivity, by at least 1 yield class.

The current FLS surveillance strategy is to undertake a crop condition survey every 3 years (*as a minimum*). Should a significant deterioration in retained stands be identified, the current silvicultural proposals will be reviewed – either at the five year mid-term review or ten year plan renewal.

7.5 Clearfell

Safety considerations have been detailed above in [Section 7.2](#).

All clearfelling within this plan is proposed in Phase 1 (2023-2027). [Section 2.2](#) & [Table 4](#) provide a summary of proposed clearfell coupes (*11006 & 11007*). These coupes, combined, make up 11.12% (*net*) of the plan area and are shown on [Maps 14a & 14b](#). They have been separated due to the different regeneration (*restocking*) techniques proposed post-felling (*see Section 2.4, Tables 8 & Section 7.11*). [Table 4](#) provides a breakdown of conifer species to be felled in each coupe. Broadleaves are proposed for retention in both coupes (*where safe to do so*). There is also windblow to be cleared in both coupes - which have not been previously thinned. Windblow in 11006 is starting to impact the southern march boundary with Gartmorn farm and has potential to affect a number of core paths. Windblow in coupe 11007 is mainly in the Norway spruce stands and is not currently affecting neighbouring ground. 11007 sits to the west of an 11kv overhead powerline. The main extraction route from 11007 will be along the existing path/track (*see Map 16*). This track travels east under the 11kv powerline and then around the north of the covered reservoir. The track will require some upgrade work, particularly where it crosses underground water pipes and electricity (*see Map 5 & Section 7.14 Operational Access*). As the forest is gradually transformed to native woodland, both coupes are becoming increasingly isolated from a viable haulage transfer point. The proposed felling will resolve this



issue and provide opportunity to link up existing areas of native woodland at restocking (e.g. with Cowpark Wood).

There are no watercourses within the proposed felling areas. A drain, at the southern boundary of the forest, borders coupe 11006. This feeds into one of the northern inlets to Gartmorn Dam SSSI. Hence, special care will be required when working along this boundary. Given the proximity of this inlet, consultation with NatureScot will be undertaken at the operational planning stage. UK Forestry Standard Forest & Water Guidelines will be followed. Extraction routes will be managed to minimize compaction and contain surface water run-off. Proposed installation of the new forest road is a key part of reducing extraction distances through the forest. The two existing ponds in the plan area are within proposed thinning and felling areas. Both their boundaries and drain inlets/outlets will be marked on the ground and protected from damage.

Landscape considerations are in [Section 7.12.6 \(below\)](#). In terms of 'adjacency' both felling coupes are separated by a mix of open ground and retained broadleaved stands. Over 25% of the area in coupe 11007 will be retained broadleaves. There will also be opportunity to retain some mature 'open grown' Fir, Norway spruce and Pine along paths within the main visitor zones.

Badgers are present within clearfelling coupe 11006 and FLS have good records of sett locations. A survey will be undertaken on all planned operational sites to identify main sett entrances, annex, subsidiary and outliers setts. A license is likely to be required prior to operational commencement and FLS will consult with NatureScot once site surveys are complete.

7.6 Lower Impact Silvicultural Systems (LISS)

See supporting [Maps 14a & 14b](#).

Lower impact silvicultural systems will be used in coupes 11004 and 11005 which together comprise 22.3 hectares or 30.8% of the plan area.

Coupe 11004 (13.62 hectares):

This management coupe comprises mainly Scots pine, just over 60 years of age. Within the pine matrix there are scattered groups of Douglas fir, Grand fir, Western hemlock and Norway spruce; all of similar age. Broadleaves are also dispersed throughout in small quantities - mainly mature oak and birch.

The overall management aim is to gradually convert this coupe to native broadleaves over a period of ~60 years. 5 -10% of existing conifers will be retained beyond this timescale (*Scots pine, Firs & Norway spruce*) to allow some diversity in forest structure and habitat. Western hemlock, which is quite invasive, will be scheduled for removal in the next few interventions.



Aerial viewpoints 1 to 4 ([Appendix IX](#)) show this coupe was worst affected by Storm Arwen in 2021. Blown trees are not in large consolidated groups but dispersed individually, or in small pockets, across the stand matrix. This pattern of windblow is similar in effect to a thinning operation, with small mini-coups created where pockets of windblow are present. Therefore, the next (*and only*) intervention within this 10 year plan period will involve removal of windblown conifer trees. It is expected ~0.85 hectares of windblow clearance will create gaps large enough for proactive restocking, and these 'pockets' will be restocked to the specification in [Section 2.4 \(Table 9\)](#) and [Section 7.11](#). With the exception of gaps created by windblow clearance, there will be no further gap or mini-coupe creation within this plan period (10 years).

For interventions in future plans, thinning will be accompanied by creation of new mini-coups (*between 0.2 and 0.4 hectares in size*) together totalling approximately 2 hectares of LISS felling per intervention. The first intervention of this type is expected to be in 2035-3036. Key considerations for the location of new mini-coups:

- Expand and link existing broadleaved areas.
- Protect and free up veteran broadleaved trees.
- Maintain harvesting access to remaining pine stands.

Each intervention will be on average every 10 years (*i.e. one intervention per 10 year management plan*). Although thinning intervals should be slightly shorter (5 to 7 years), the current preference is for longer intervals between commercial harvesting operations. This is due to the small size of the forest, its' high public usage, potential effects on sensitive heritage features and nearby protected conservation sites. This will be reviewed at the plan mid-term review (5 years) and 10 year plan renewal. Impact of operations and tree stability will be key considerations.

Coupe 11005 (8.68 hectares):

This coupe comprises 2 distinct age classes, both containing birch as the dominant species:

1. Stands regenerated in 2004 (~18 years old).
2. Stands regenerated in 2014 (~8 years old).

The 8 year old stands are currently spread across 8 mini-coups, 5 of which are scattered through coupe 11004 (*p1960 Scots pine*) – see [Map 14a](#). All have been enriched with Sessile oak, planted at ~15 metre centres in 1.2 metre tubex guards.

Both the 8 and 18 year old stands are at the development stage where thinning will improve crown health, tree stability and stem quality (*covered below in [Section 7.7.2](#)*). The 8 year old stands include mini-coups dispersed through coupe 11004. These contain windblown stems



from surrounding Pine stands and it is proposed to clear these stems during commercial thinning of coupe 11004.

7.7 Thinning

For a summary of thinning areas see [Tables 6 & 7 \(in Section 2.3\)](#) and supporting [Map 15](#).

Management proposals for thinning in **Visitor Zones** are detailed in [Section 7.16](#)

7.7.1 Commercial conifer thinning

General principles:

In productive stands thinning will normally be carried out at, or below, the level of marginal thinning intensity (*i.e. removing no more than 70% of the maximum MAI, or YC, per year*). Higher intensities (*no more than 140 % of maximum MAI, or YC, per year*) may be applied where thinning has been delayed, larger tree sizes are being sought, as part of a LISS prescription or where windblow is being cleared. Thinning type and selection of trees for retention should be species specific and reflect the growing characteristics of the species present. A record of thinning operations must be recorded at completion of a thinning operation using basal area sweeps or stems per ha sample plots - the crop information being input to the national sub-compartment database to allow forecasting of next thin year and thinning yield.

Priority for removal:

- Trees with poor stem form, previous harvesting or storm damage, and unhealthy/small crowns.
- Conifer trees growing directly on the designed landscape earth bank features.
- All Western hemlock - where this does not create large gaps in the canopy.
- Conifer trees suppressing mature/veteran broadleaves.

Coupe specifications ([see Map 14a](#)):

Commercial conifer thinning is spread across two management coupes:

- Irregular shelterwood coupe 11004
- Long-term retention coupe 11003

There will also be some windblow clearance in the birch mini-coupes making up the northern zones of coupe 11005, as some of the windblown pine from 11004 has fallen into these mini-coupes.

Coupe 11004:

Within **irregular shelterwood coupe 11004** the dominant species is p1960's Scots pine with small pockets of Norway spruce, Firs, Western hemlock and mixed broadleaves. The pine stands, in particular, have multiple windblown stems dispersed throughout the matrix ([see aerial](#)



viewpoints 1 to 4, Appendix IX). The aim is to remove this windblow and ‘thin out’ denser groups in the standing matrix. The remaining pine trees should be given sufficient room (*a light demander*) to expand their crowns and grow unrestricted for the subsequent 10 year period. Tree retention should focus on trees with good stem form, larger healthy crowns & limited stem/root damage.

Target basal area for retained trees post-thinning should be between 23m² and 25m² per hectare **or** 1,000 stems per hectare (*average 3.2m x 3.2m spacing*). Existing mature broadleaves should be retained and protected with the use of halo thinning where existing conifers are suppressing them. Western hemlock should be removed. Norway spruce & Firs thinned or removed (*where suppressing broadleaves*). Broadleaved fallen and standing deadwood should be retained where safe to do so, as should a small proportion of conifer material.

Coupe 11003:

During the previous felling intervention (*in 2009*), access to **long-term retention coupe 11003** was gained by crossing under the 33kv overhead powerline from coupe 11004. If this can be achieved safely at the next intervention then the majority of Norway spruce should be removed (*leaving 10% of the most stable trees*). The Scots pine areas in 11003 should be heavily thinned. Target stems per hectare in retained pine should be 400 to 450 stems per ha or average ~5 metre x 5 metre spacing. Retained trees should have good wind stability characteristics, limited stem/root damage and healthy symmetrical crowns – for retention as ‘old growth phase’ trees.

7.7.2 Pre-commercial thinning LISS coupe 11005

Pre-commercial thinning is proposed for predominantly birch areas regenerated in 2004 (~18 years old) and 2014 (~8 years old). The 8 year old stands have been enriched with Sessile Oak planted at about 15 metre spacing in 1.2 metre tubex guards. Young western hemlock natural regeneration has become quite abundant in these areas and requires removal.

The next intervention for both stand types will be a pre-commercial thinning or respacing operation using either clearing saw or chainsaw. In all areas, trees will be cut to residue in-situ, ensuring drains are not blocked and path networks not obstructed.

The **18 year old stands (p2004)** have been previously thinned and at the stage where operator selective thinning is important. Where present, retained trees should have straight single stems with healthy live crowns – the latter should ideally extend to 50% of tree height. Retained stems (*post thinning*) should be on average no less than 3 metres apart (*1,100 stems per ha*). Any oak, rowan, hazel & aspen should be prioritised for retention. Western hemlock should be prioritised for removal. Up to 10% other conifer species can be retained (*Pine, Fir, Norway spruce*) - leaving no more than one of these species every 15 metres. Stems being removed should be cut as low to ground level as possible.



The **8 year old stands (p2014)** include some very dense areas of birch natural regeneration. A clearing saw is more suited to the size and number of tree stems present. Stem selection is not yet a priority at this stage. Key objectives:

- Prioritise oak, rowan, hazel and aspen for retention and ensure it is not suppressed by other tree species such as conifers.
- Keep birch surrounding the oak close enough (~1.5 metres) to draw the oak upwards and reduce epicormic growth.
- Remove tubex guards where oak is >0.5 metres higher than the top of the tube and developing a vigorous crown. Retained tubes/stakes that are damaged or leaning should be fixed/replaced.
- Within the surrounding matrix of birch regeneration, widen spacing between individual birch trees to 3 metres apart (1,100 stems per hectare).
- Remove all western hemlock.
- Up to 10% other conifer species can be retained (*Pine, Fir, Norway spruce*) - leaving no more than one of these species every 15 metres.
- Stems being removed should be cut as low to ground level as possible.

7.7.4 Long-term Retention Thinning

Coupe 11003 has been covered above in [Section 7.7.1](#) commercial conifer thinning. The remaining long-term retentions (LTRs) are predominantly broadleaved or mixed stands with developing semi-natural characteristics. Thinning will be limited to:

- Amenity thinning along paths.
- Protecting existing veteran broadleaves (e.g. *halo thinning*) and increasing stability of selected old growth conifers (e.g. *removing sub-dominants around a selected conifer 'wolf' tree*).
- Removing hazards (e.g. dangerous trees along paths, march boundaries or utilities).

Where a limited number of conifers are retained, they should be Pine, Firs or Norway spruce and **not** Western hemlock. The latter will only act as a source of invasive natural regeneration if retained.

Thinning in LTRs is expected to be well below the level of marginal thinning intensity.



7.8 Other Tree Felling in Exceptional Circumstances

FLS will normally seek to map and identify all planned tree felling in advance through the LMP process.

However, there are some circumstances requiring small scale tree felling where this may not be possible and where it may be impractical to apply for a separate felling permission due to the risks or impacts of delaying the felling.

Felling permission is therefore sought for the LMP approval period to cover the following circumstances:

- Individual trees, rows of trees or small groups of trees that are impacting on important infrastructure (*as defined below**), either because they are now encroaching on or have been destabilised or made unsafe by wind, physical damage, or impeded drainage.
*Infrastructure includes forest roads, footpaths, access (*vehicle, cycle, horse walking*) routes, buildings, utilities and services, and drains.

The maximum volume of felling in exceptional circumstances covered by this approval is **75 cubic metres (approximately 3 lorry loads of timber) per Land Management Plan per calendar year.**

A record of the volume felled in this way will be maintained and will be considered during the five year Land Management Plan review.

7.9 Restructuring

By implementing the management proposals in this plan, the distribution of age classes within Gartmorn is expected to increase over the next 20 years (see [Section 7.17](#), [Figure 4](#)). As displayed in [Figure 4](#), the aim is to achieve a more balanced age distribution across age classes 0-20, 41-60 and 81-100 years. Older age classes, in both conifers and broadleaves, are expected to increase through use of long-term retentions, irregular shelterwood and minimum intervention (*natural reserves*). The west of the plan area incorporates a range of management systems...

- Clearfell (in the short-term)
- Irregular shelterwood
- Long-term retention

The different management prescriptions used in each system will help to diversify age and stand structure.



In the east of the forest, the natural reserve will limit active management but there is already some structural development in areas of storm damage – where sporadic areas of natural regeneration are appearing (see [Appendix VIII](#), photos 13 – 16).

As the conifers in the plan area are gradually reduced, it will be important to retain a proportion to ‘old growth phase’ Pine, Fir and Norway spruce. This can be achieved as mini-coupes are created in irregular shelterwood stands and through targeted retention of some conifers in the long-term retention stands (see *below*).

In areas of dense birch regeneration it will be important to ensure native broadleaves have a diverse range of species present through enrichment and selective thinning. This can be achieved at restocking and subsequent pre-commercial thinning stages (see [Sections 7.7.2 & 7.11](#)).

7.10 Long-term retentions and Minimum Interventions

7.10.1 Long-term Retentions (LTRs)

LTRs are individual, stable stands and clumps of trees retained for environmental benefit significantly beyond the age or size adopted for commercial management. Areas prescribed for long-term retention make up 16.81 hectares (23.2%) of the plan area ([Map 14a](#)). Coupe 11003 is the only pure conifer stand, the remaining areas (*coupes 11002 & 11009*) are dominated by broadleaves in both pure & mixed stands. Thinning management in LTRs is described above in [Section 7.7.1 \(11003\)](#) and [Section 7.7.4 \(11002 & 11009\)](#). With the exception of coupe 11003, there will be a low intensity of management, with interventions to:

- Harvest small amounts of timber.
- Identify and recruit potentially stable trees for development to ‘old growth’ phases (*broadleaves and some conifers*).
- Amenity thinning along paths.
- Protect existing veteran broadleaves (*e.g. halo thinning around veteran broadleaves*).
- Remove hazards (*e.g. dangerous trees along paths, march boundaries or utilities*).

Retention of deadwood will be a key priority in LTRs and every opportunity should be taken to retain both standing and fallen deadwood where safe to do so.

7.10.2 Minimum Intervention (Natural Reserves)

The minimum intervention natural reserve is located in the east of the forest (*coupe 11001*, [Map 14a](#)). It covers 19.09 hectares or 26.3% of the plan area and provides a distinct zone where the woodland can develop naturally.



The stands are predominantly native broadleaves with a small area of Scots pine. The main age class is just over 60 years but a considerable proportion of younger natural regeneration is dispersed throughout the coupe. Fallen and standing deadwood levels are high in this part of the forest (*Map 8*). The Native Woodland Survey of Scotland (2006-2013) determined this area to have high levels of semi-naturalness in relation of native species composition, natural woodland structure and natural regeneration.

The management objective is to monitor the woodland's natural development and the presence of potentially invasive species. Rhododendron and western hemlock have the potential to affect the woodland field layer and have been controlled in the past. This would be the only intervention taken in the plan period if deemed necessary.

Several narrow boundary zones of the original natural reserve have been prescribed as LTRs (*Map 8*). These areas border overhead powerlines and a well used core path. They are likely to require a low level of thinning or felling intervention for safety and amenity purposes, but otherwise will be left to develop naturally.

7.11 Restocking proposals, future habitats and species

Map 17 (future habitats & species) and *Map 14a (management coupes & felling plan)* support this section.

As described throughout this plan, the long-term management objective is to gradually transform the plan area to predominantly native broadleaves allowing for up to 10% conifer species dispersed throughout stands as an alternative 'old growth' habitat.

Guidelines set out in the Forestry Commission's Ecological Site Classification (ESC) Bulletin 124 have been used to inform the most suitable broadleaved species and woodland types. This system uses climatic zone, exposure, soil moisture, soil nutrient levels, together with on-site survey of soils and ground vegetation. Other key considerations include plant health risks, amenity and conservation objectives, and future predicted changes in climate (*e.g. the timing of seasons, annual rainfall and growing season temperatures*).

Intimate species mixtures will be actively encouraged during restocking and pre-commercial thinning operations. Planting stock should be well-adapted to the local climate. Seed zone 203 should be used as a preference but if unavailable, adjacent zones should be used (*see link below*).

<https://forestry.gov.scot/publications/forests-and-the-environment/biodiversity/native-woodlands/seed-sources-for-native-trees-and-shrubs>



Open space is expected to remain constant in the long-term, these areas are mainly concentrated in utility wayleave zones. There will also be opportunity to create small deer glades as part of the proposed restocking allocation for open space (*Table 8, Section 2.4*). Locations will be assessed by delivery teams subsequent to harvesting operations.

7.11.1 Restock prescriptions for clearfell coupe 11006 (6.09ha) & LISS coupe 11004 (0.85ha)

In these coupes natural regeneration, particularly of birch, is expected to be abundant. This is demonstrated in adjacent areas making up coupe 11005.

Although soil wetness varies within the plan area the most suitable native woodland type is National Vegetation Classification W11 *Quercus petraea – Betula Pendula – Oxalis acetosella*. As the main species naturally regenerating is *Betula pendula* (*Birch*), active management will focus on other tree species within the NVC W11 woodland type.

Therefore, manual screef & direct/flat plant the following species at 10m-15m centres in tubex guards: Sessile oak 70%, Aspen 10%, Rowan 10%, Hazel 10%.

This planting is to cover the whole site but will make up approximately 4% of the plantable area (*assuming total a target stocking density of 1,600/ha*).

‘No-planting’ buffers:

- Oak should be planted at least 15 metres back from fence lines and the Scottish Water covered reservoir boundary.
- Remaining tree species should be planted at least 10 metres back from these boundaries.
- Do not plant within 5 metres of surfaced paths.
- Do not plant within 10 metres of heritage earthbanks.

The remaining matrix will be allowed to fill in with broadleaved natural regeneration (*mainly birch*) - as has occurred in previous felled areas (*e.g. management coupe 11005*). Pre-commercial respacing, once the crop is established (>year 5), will aim to bring densities down to 2000 stems per hectare. Any conifer natural regeneration should be reduced to 10% of area, removing all Western hemlock as a priority.

A standard ‘stocking density assessment’ survey will be undertaken at the end of growing years 1 and 5.

Bracken Areas

In the eastern zones of coupe 11006 a dense bracken layer has been developed under mixed Pine/Larch stands. At restocking, higher physical guarding densities may be required here so that



manual control of Bracken can be undertaken. These areas also have active badger populations and methodology for planting within sett buffer zones is detailed below in [Section 7.11.3](#) and [Appendix VI](#).

7.11.2 Restock prescriptions clearfell coupe 11007

This coupe is located at the western edge of the plan area and deemed to have less potential for natural regeneration. Restocking will be achieved through low impact cultivation and 100% planting. Once the coupe is felled, the site will be assessed for the most suitable cultivation and tree protection methods. This will be based on harvesting residue levels, soil wetness, expected mammal browsing pressure (*population densities*) and possible restrictions to wildlife (*deer*) control.

Species will be planted in the following proportions (*intimate mixture*): Sessile oak 40%, Birch 30% Aspen 10%, Rowan 10%, Hazel 10%. In localised wet zones Downy birch and Willow species will be used.

‘No-planting’ buffers:

- Oak should be planted at least 20 metres back from utilities infrastructure.
- Remaining tree species should be planted atleast 15 metres back from such infrastructure.
- Oak should be planted at least 15 metres back from fence lines.
- Remaining tree species should be planted atleast 10 metres back from these boundaries.
- Do not plant within 5 metres of surfaced paths.
- Do not plant within 10 metres of heritage earthbanks.

The most likely form of physical protection will be low density 1.2m tubex guarding targeted on tree species most susceptible to mammal browsing.

Weeding will be undertaken as required and identified by site observation during annual crop surveys.

Target stocking density at year 5 will be 1600 per hectare (2.5m x 2.5m) and standard ‘stocking density assessment’ survey will be undertaken at the end of growing years 1 and 5.

7.11.3 Restock prescriptions badger sett buffer zones

[Appendix VI](#) provides a more detailed specification for planting and associated works around badger setts. This methodology has been agreed with NatureScot in other forests managed by Forestry & Land Scotland. All planting of any known sett location will be at low density within specified buffers. No planting should take place within 3 metres from sett entrances. The planted



species will be small native tree and shrub species (*e.g. rowan, birch, hawthorn, etc*) and not larger tree species.

7.12 Biodiversity, Wildlife Management & Landscape

This plan has been prepared in cognisance of relevant legislation and policy, including European and domestic environmental legislation, UK nature conservation policy and local biodiversity guidance. Guidance relevant to the plan is listed below:

- The Conservation (Natural Habitats &c.) Regulations 1994 as amended.
- The Wildlife and Countryside Act 1981 (as amended).
- Scottish Planning Policy.
- UK Forestry Standard.
- Clackmannanshire Local Development Plan.
- Stirling & Clackmannanshire Forestry and Woodland Strategy
- Clackmannanshire Biodiversity Action Plan.

More details on the forest's existing biodiversity and heritage resource are provided in [Appendix I, Section 11](#). Management proposals aim to protect and expand this resource in line with the above guidance, and the UK Woodland Assurance Scheme.

7.12.1 Habitat and Species Management

Badger populations are located within the plan area. During the next plan period, proposed clearfelling will infringe on existing setts. FLS have good records of sett locations but prior to work starting a survey will be undertaken to identify main sett entrances, annex, subsidiary and outliers setts. A license is likely to be required prior to operational commencement and FLS will consult with NatureScot once site surveys are complete. Post-felling, lower densities of small native trees and shrubs will be planted within sett buffer zones (*specified in [Appendix VI](#)*). When this native woodland is properly established the management prescription of clearfell will be reviewed. Preference will be given to lower impact silvicultural systems or long-term retention management.

In line with regional and national environment priorities Forestry and Land Scotland as a partner in the "Scottish Raptor Monitoring Scheme" (SRMS) will continue its work to protect and support raptor populations within our land holdings. Working with local conservation organisations and the SRMS's local raptor study groups, opportunities will be identified as part of the work plan process to protect and bolster these priority species through habitat creation, modification and the monitoring of populations.

Proposals in this plan are aimed to improve and expand habitats that will support a diverse range of species. Large 'old growth' phase trees will be promoted in many areas by retaining trees well



beyond economic felling age. In long-term retentions and the natural reserve, lower intensity and minimum intervention management (*respectively*) will allow natural processes to influence stand structure and woodland ecological characteristics. Management for deadwood is covered below in [Section 7.12.3 \(below\)](#).

Within the lifetime of this plan, Forestry and Land Scotland propose the following pro-active operations, this will be subject to available staff and financial resources:

- 1. Installation of bat boxes:** Installation of 10 bat boxes throughout the Natural Reserve coupe, these will act to bolster existing populations and provide valuable roosting habitat whilst the woodland matures and natural cavities become more widely available.
- 2. Installation of Barn owl and Tawny owl boxes:** These will act to bolster local populations and provide nesting habitat until such time as the woodland matures and natural roost features become more abundant.
- 3. Installation of Kestrel boxes:** These will support the local population by providing nesting habitat until such time as suitable natural features develop within the woodland.
- 4. Pond Creation:** There are currently only two small ponds recorded within the forest, opportunities will be taken to identify sites for further pond creation, expanding and connecting ponds at a landscape scale will provide habitat for a range of aquatic and terrestrial species. This will involve installation of a number of small scrape ponds. These will be located in long-term retention areas of low density broadleaved woodland. Work would avoid the removal of any native tree species however limited thinning may be required to allow machine access. Ponds would be circa 5 m x 5 m and between 1- 2 m deep with shallow margins. Ideally the margins will be planted with a native wetland species mix to increase biodiversity, provide additional habitat for pollinators.
- 5. Installation of Osprey Platform:** These birds have been seen repeatedly foraging over the Gartmorn Dam SSSI to the south of our landholdings. The creation of platforms within the natural reserve area will provide safe and secure nesting sites for the expanding population within the area.
- 6. Pine Marten:** Although currently not recorded within this woodland block pine marten populations are well established throughout Clackmannanshire, the installation of pine marten boxes within the natural reserve area will bolster these populations and provide safe areas for marten to breed and continue their expansion.



- 7. Red & Grey Squirrel:** A key objective of the plan is to move towards native broadleaved woodland. It is recognised this will increase habitat for grey squirrel. The installation of Pine marten boxes should help control populations of grey squirrel. Retention of up to 10% conifer species such as Pine, Norway spruce and Firs will provide some habitat for red squirrel but, given the large areas of broadleaved woodland surrounding the plan area, it is deemed more viable to focus red squirrel conservation efforts on larger FLS forests such as Devilla (*Fife*) and Carron Valley (*Stirlingshire*). We will assess the trend in grey squirrel populations over the plan period and retain the option to use active control measures if necessary.

7.12.2 Water Environment

(See [Map 3 Landform & Hydrology](#)) There are no burns within the felling areas but a drain on the southern boundary of the forest borders coupe 11006. This feeds into one of the northern inlets to Gartmorn Dam SSSI. Hence, special care will be required when working along this boundary. Given the proximity of this drain, consultation with NatureScot will part of the operational planning process. It is also important that extraction routes are properly managed to minimize compaction and contain surface water run-off, particularly during prolonged periods of wet weather.

The two existing ponds in the plan area are within proposed thinning and felling areas. Both their boundaries and any drain inlets/outlets will be marked on the ground and protected from physical or chemical damage. Native trees will be allowed to regenerate naturally in riparian zones but this will be monitored and reviewed periodically to ensure:

1. A mix of light and shade environments.
2. Removal of dense conifer natural regeneration.

Pond creation is described above in [Section 7.12.1](#).

All operations will follow UK FS Forest & Water Guidelines.

7.12.3 Native woodland characteristics and deadwood potential

Full details of native woodland characteristics in the plan area are provided in [Appendix I, Section 11](#) and supported by [Maps 6, 7 & 8](#). The proposals in this plan aim to improve native woodland connectivity by continuing to link 'core' woodland areas (see [Map 7](#)). Areas in red, shown on map 7, (*'Primary Zones'*) will be gradually converted from conifer to native woodland. The removal of conifer stands in coupes 11006 & 7 and restocking with native broadleaves will connect up zones of high semi-naturalness – see [Map 6](#) and [Map 14a](#).



By the end of the plan period the aim is to form a connected native woodland habitat zone from the forests' south-western boundary to the natural reserve in the east - intended to create a connected zone of 'core' woodland habitat. This will directly link to 'core' woodland habitat zones to the south-east of the plan area (*Cowpark Wood*).

In future interventions (*future plans*) the conversion of north-western conifer stands (*coupe 11004*) to native broadleaved woodland will aim to connect remaining areas of native woodland throughout the plan area. This will be tempered by the objective to maintain up to 10% conifers (*Pine, Firs, Norway spruce*) as a resource for red squirrel and raptors, and the installation of access infrastructure (*Section 7.14*) to manage the woodland for low output hardwood products.

In terms of deadwood resource, the UK Woodland Assurance Standard (*UKWAS*) target is an average of 20 m³ per hectare (*both standing and fallen deadwood*).

Table 16 (*below*) shows the proportions of the plan area currently having high, medium and low deadwood potential:

Assessed Deadwood Potential	Area (Hectares)	Future Volume Estimate (m ³ /ha)	Total Future Volume (m ³)
High	28.5	100	2850
Medium	43.76	30	1312
Low	0.13	15	1.95

Total future potential in the plan area is estimated to be 57.5 m³ per hectare.

Map 8 shows the location within the plan area of high, medium & low 'deadwood potential' zones.

The majority of area in the eastern half of the forest will be left as a natural reserve and deadwood will be allowed to develop naturally. In the western half of the forest a range of management tools will be utilised to increase deadwood resource and these should be included in operational workplans:

- Broadleaved deadwood will be prioritised for retention.
- Deadwood will be concentrated where it will provide the highest ecological benefit (*Map 6 & 7*) and in areas less likely to be disturbed by future operations, such as long-term retention areas.
- Where conifer stands are clear felled or thinned in Phase 1, a proportion of windblown stems will be made safe and left in situ.



- In long-term retention thinning areas a proportion of standing injured or dying trees will be retained - where away from visitor zones, roads and march boundaries.

7.12.4 Invasive Non-Native Species (INNS)

Currently the main threats within the plan area from INNS are Rhododendron (*Rhododendron ponticum*) and Western hemlock (*Tsuga heterophylla*). The latter species in other situations would be utilised as a commercial timber species but its vigorous regeneration and shade casting characteristics are deemed incompatible with conversion to native broadleaved woodland. In the eastern half of the plan area (*minimum intervention natural reserve coupe 11001*) work is already underway to remove these two species. Further priority work is programmed to follow-up on these operations. Annual surveys will also be undertaken to assess success of control and any re-growth. The small areas of long-term retention in the eastern half of the plan area (*coupe 11009*) are deemed to be ecologically connected to the natural reserve, thus INNS will be controlled with the same priority.

In the western half of the plan area, there will be a priority to remove Western hemlock through programmed thinning operations (*commercial, pre-commercial and conservation thinning*). This has been identified in thinning and crop establishment prescriptions (*above*).

Rhododendron in these areas will be monitored with future control reviewed by the Environment Team at regular intervals.

7.12.5 Wildlife (Deer Management)

Deer control in the forest has become more challenging due to:

- Visibility in windblown stands and dense naturally regenerated restock areas.
- High visitor numbers and an extensive network of desire lines - often through quite thick understorey vegetation.

It is recognized that, despite these constraints, increasing deer numbers will be detrimental to the development of native broadleaved woodland (*and associated field layers*). Higher deer numbers will also affect surrounding broadleaved woodland such as Cowpark wood. Forestry and Land Scotland is currently reviewing its wildlife management strategy within the plan area and it is expected that deer control will continue to be an important component of management. Continued partnership working with local landowners and managers will also be an important objective. As visibility is a key constraint within the forest, it will be important to maintain thinning programmes, particularly pre-commercial thinning in dense naturally regenerated stands. Clearance of windblow in LISS coupe 11004 and clearfelling proposed in coupes 11006 & 7 will provide additional opportunity to increase deer control and create small managed deer glades. This will be a key factor in timely establishment of restock sites.



Some areas of open space have a dense bracken layer. Control of this vegetation will improve visibility and make deer control visits more effective. This can be implemented using a motorised flail and FLS are currently testing remote controlled models.

Given the generally flat nature of the terrain and lack of backdrops, the use of deer shooting mounds will be an important tool where this does impact other objectives (*landscape, visitor zones, heritage features*). This will be re-assessed at the plan mid-term review and renewal stages.

7.12.6 Landscape & Visual Considerations

Appendix I, Section 9.0 provides the landscape context for this land management plan. Map 4 - the wider landscape setting shows the landscape character types and local landscape designations the plan area has potential to influence. Appendix VIII ground-based photo viewpoints, together with supporting Map 10, identify key viewpoints that will be influenced by the plan's management proposals.

In the long-term, management as a continuous cover native woodland is not expected to conflict with or diminish key characteristics and scenic views within the landscape character types in this area. Once unstable conifer stands (*coupe 11006 & 11007*) have been cleared (*see below*), future felling interventions will comprise LISS thinning and mini-coupe felling. Expected stand interventions will be at about 10 year intervals. This long-term strategy should be more sympathetic to sensitivities identified for both 'The Forest' Local Landscape Area and 'The Ochils' Local Landscape Area (*Appendix I, Section 9.0*).

The largest *immediate* impact will be from proposed felling operations in Phase 1 (*see Map 14a*). The total proposed felling area in the first 5 years (*including LISS felling*) covers 12.29 % of the plan area.

The LISS felling (1.17%) will comprise small groups of existing windblow caused by Storm Arwen. They are scattered within the matrix of standing Scots pine p1961 in coupe 11004 (*Appendix IX, aerial viewpoints 1 to 4*). Other than windblow clearance, these Pine stands will be retained and there is expected to be limited impact on the wider landscape. The clearance of windblow should also improve internal views and visitor experience by increasing visibility and pedestrian access through stands.

Clear felling of coupe 11006 and 11007 (11.12%) is concentrated in the south-west of the forest. Appendix VIII & Map 10 shows viewpoints of these coupes both as local edge views from core paths (*Photo 1*) and medium-scale views from Gartmorn Dam Country Park (*Photos 3, 4, 5, 6, 8, 10*).



From the Country Park these felling coupes appear in the landscape as darker canopy tops, the lower edge of these stands are screened by broadleaf woodland surrounding the Country Park & reservoir. This screening effect will help limit the impact of conifer removal and help maintain the appearance of continuous woodland cover – an important characteristic of the ‘The Forest’ Local Landscape Area designation. The proposed restocking with native broadleaved woodland should help the plan area blend more sympathetically with surrounding woodland in the long-term. There will be a reduction in diversity of woodland types/shapes by removing these conifers but retention of up to 10% conifers will help mitigate this to some extent.

Local and internal edge views are expected to experience greatest change as a result of clear felling coupes 11006 & 11007. It is hoped the following factors will help mitigate this impact:

- Clearance of the unattractive windblow.
- The fragmented shape of coupe 11006 and presence of broadleaved stands of varying age class around the felling area. This will help reduce the perceived size and scale of the felling area, both within and at the boundary of the forest.
- Retention of mature broadleaves within both felling coupes. 27% of the area in 11007 will have retained broadleaves.

Proposals for historical designed landscapes are in [Section 7.13 Heritage](#).

Other management proposals in this plan considering visual landscape impacts:

- [Section 7.9 Restructuring](#).
- [Section 7.16 Woodland Management in Visitor Zones](#).

7.13 Heritage

There are no Scheduled Monuments within or adjacent to the plan area.

FLS maintains extensive archaeological records within our heritage database. Important historic features are surveyed, recorded, mapped and monitored to ensure and demonstrate FLS compliance with the UK Forestry Standard. Pre-operational surveys ensure unrecorded historic features are identified prior to forest management operations, so additional controls can be put in place for their protection. [Map 5 \(site constraints & sensitive features\)](#) identifies the boundaries of known heritage features within the forest boundary. [Appendix I, Sections 13 Table 11](#) provides a detailed list of known heritage features within or in the vicinity of the forest.

7.13.1 Non-scheduled Archaeology

Four sites of archaeological interest are recorded within (*or on the boundary of*) the forest. The first three have single locations:



1. Gartenstars Plantation: Colliery - A coal pit and shaft (Period Unassigned) NS 9125 9533 at the northern boundary of the forest adjacent to the B9140 within open space coupe 11008.
2. Gartmorn Coalpots: Quarry - Old sandstone quarry, possibly used to build Schawpartk Mansion in 1700s; NS 9132 9482 on the eastern boundary of irregular shelterwood coupe 11005
3. Hamilton Wood: Farmstead - the remains of a farmstead NS 9069 9504 on the western boundary of the plan area within the long-term retention coupe 11002

Hamilton Wood Farmstead sits just outwith the plan area but there are no boundary markers in this location. Operations in this area will be limited to safety and conservation thinning.

The Colliery and Quarry are within the plan boundary and the management objective for both sites is monitoring and protection from forest operations. They have both been mapped and recorded on FLS records to allow quick detection and marking on the ground in order to protect from future damage.

The fourth heritage feature known as ‘Octagon Wood’ is located in the western half of the forest and is perhaps the most important within the plan area (*shown on Map 5 & Appendix VII*). A separate section to describe the features of Octagon Wood is included in [Appendix I - Section 14](#). They form part of a larger early 18th Century designed landscape stretching to Alloa. The main ground features are linear earth banks in varying condition, approximately 1 metre high by 1.5 metres wide. These banks form a large, central octagon feature near the western boundary of the forest (*now containing the covered reservoir*). Linear avenues, or pairs of parallel earth banks, extend outwards from this central octagon. These avenues are positioned at regular geometric intervals around the octagon (*like the spokes of a wheel*) and extend outwards to terminate at smaller circular features. Gartmorn forest is thought to be one of the few locations nationally where this formal design is demonstrated so clearly.

Forestry and Land Scotland have ground surveyed and recorded these features in its’ heritage database and recognize the strategic importance of these features. The proposal for new access infrastructure has specifically taken account of this formal geometric design (*see Map 18*) . Surveys have been completed to assess how forest machines can work within and around the designed features in order to preserve them. [Section 7.3](#) lists control measures to be undertaken during forest operations.

Future programmed LIDAR surveys on the national estate are hoped to provide greater information on these features. This will assist with their continued management and preservation. The surveys may reveal further features relating to this designed landscape.



Octagon Wood and the wider designed landscape of this period has attracted significant interest /research by Edinburgh University and charitable organisations such as ‘Scotland’s Garden and Landscape Heritage’ and ‘Gartmorn Dam Country Park Development Trust’. Where resources allow, Forestry and Land Scotland will continue to work with these parties to further the awareness and protection of this designed landscape. In this respect, Edinburgh University have recently been granted permission to conduct further ground surveys within the woodland. FLS will also consider a request to plant the earth banks with beech, a highly favoured species in the early 18th Century for marking avenues. There would need to be an assessment of how planting would interact with other management objectives and this is best considered once windblow from Storm Arwen has been cleared.

7.14 Operational Access

Existing operational access to the plan area is shown on [Map 16 - access & proposed forest roads](#) and described in [Appendix I, Section 6.0](#).

Key health & safety considerations for civil engineering work (*and other forest operations*) are detailed in [Section 7.2 \(health and safety controls during key operations\)](#). Controls to protect the designed landscape features during operations are detailed in [Section 7.3 \(Operational controls for designed landscape heritage features\)](#).

7.14.1 Proposed new forest road & upgrade

A key objective in this plan is to improve operational access so that FLS can maintain the plan area as a continuous cover woodland and comply with the UK Forestry Standard & UK Woodland Assurance Scheme. The following infrastructure is proposed to achieve this:

630m of new spine road with a turning point at its western end (*580m new road & 50m turning point*). The turning point will allow space for site storage and welfare units. The road will reduce extraction distances for the proposed commercial thinning of coupe 11004, clear felling of 11007, and clear felling of west and central zones of coupe 11006. In the long term it will provide management access throughout the western half of the forest for management of expanding native woodland areas. It will also allow timber stacking, loading and lorry turning away from the private residential access road.

Location and design of the proposed spine road in relation to heritage features and existing paths is shown on [Map 18](#). The new road will extend from the existing spur road (*transfer point*) at NGR: NS 9136 9514, travelling west through an existing break in a heritage earth bank (*NS 9120 9509*) then run south-west parallel to and at a central point between the two earth banks forming the northern ‘spoke’ of the heritage feature. This surveyed route will allow sufficient space for a forwarder machine to run adjacent to the new road (*for timber stacking*) between



the earth banks and the road edge. From NGR: NS 9110 9501 a high specification surfaced path runs adjacent to the proposed road line. The new road will replace this path and ensure safe connection to the high specification path running south-east. In the long term an assessment of pedestrian access requirements along this new road will be undertaken by the FLS Visitor Services Team. It is intended to maintain a similar level of surface quality to the adjacent path network.

To enable installation of this new road and turning point, the majority of the proposed route will require felling and associated windblow clearance within coupe 11004.

Once the road is installed, new entrance security infrastructure is proposed where the new road joins the private farm access track (*NS 9141 9515*). The aim will be to restrict unauthorised vehicle access (*including motorbikes*) whilst complying with SOAC guidelines (*Scottish Outdoor Access Code*).

Also proposed, a **40 metre long layby** on the west side of the private farm access track (*NGR: NS 9145 9483*) which will allow timber loading for the eastern section of felling coupe 11006. This area is currently open space with a few scattered Norway spruce trees - likely to need removing prior to layby installation. Badgers are present within the SP/EL p1961 to the south of the proposed layby and FLS have good records of sett locations. A survey will be undertaken to identify main sett entrances, annex, subsidiary and outliers setts. A license is likely to be required prior to operational commencement and FLS will consult with NatureScot once site surveys are complete.

In planning for the above layby installation, FLS have consulted Gartmorn farm and it has been agreed that lorries can turn in the farm yard in order to avoid construction of a turning point on the farm access road. Due to ongoing unauthorized use of this farm access road, the farmer has requested that the layby is removed once felling and haulage operations are complete. In the long-term this zone of the forest is not intended to be managed for high output timber supplies so arrangements can be agreed between FLS and the farmer for removal of the layby and re-planting with native woodland.

7.14.2 Proposed track upgrade

The existing path will be upgraded from the western end of the new forest spine road (*NS 9085 9488*) to the northern boundary of coupe 11007 (*NS 9074 948*). This will allow forest machine access for timber harvesting & extraction of coupe 11007. A new road to this coupe was not deemed appropriate or necessary due to:

- Space limitations between the covered reservoir and Alloa golf course.



- Proposed construction of the new spine road to the east (*reducing extraction distances to a transfer point*)

The upgrade work is likely to require:

1. A small amount of tree felling on the southern side of the existing track and along the north-west boundary of the covered reservoir.
2. Stone reinforcement and widening of the existing track, particularly where it crosses an underground water pipe and underground power cable.

This route is also used by utilities providers to access the covered reservoir and electricity infrastructure from the A908 to the west. Hence, prior consultation will be required to agree crossing point specifications, access arrangements and reinstatement work.

7.15 Recreation

(See supporting *Map 9 - non-motorised path networks & visitor zones*)

The proposed management focus within this plan:

1. Maintenance of the existing footpath network, including regular inspections and programmed maintenance of access infrastructure.
2. Clearance of windblown areas to open up the wider unsurfaced path network.
3. Woodland management in visitor zones (see *Section 7.16 below*)

A significant amount of work was completed in the previous plan to link up the wider core path network and improve circular walks between the plan area, Country Park and local settlements. Within the plan area this included 1.18 km of path upgrade, associated tree safety felling and landscaping.

People counters are located at the eastern end of the plan area where it links to Gartmorn Dam Country Park. The equipment is now quite old and due to be updated in the next few years. This will provide more consistent and accurate information on visitor usage. The information for 2019 shows 8156 visitors. The mid-term review will again assess visitor demand and the potential for increased infrastructure.

There has also been investigation into formal car parking facilities but this was not deemed appropriate given vehicle access constraints to the forest and the small size of the plan area. The case for car parking is further diminished by the potential affect on other key objectives such increasing nature conservation value and potential conflict with neighbouring properties - if anti-



social behaviour increases. Furthermore, there is considerable visitor offering at nearby outdoor locations such as Devilla Forest and Gartmorn Dam Country Park.

FLS are open to working with local partners and outdoor interest groups to consider the following opportunities where resources are available and other key objectives are not affected:

- Improved walking links.
- Outdoor education and well-being events.
- Improved awareness and interpretation.

7.16 Woodland Management in Visitor Zones

Visitor Zones have been identified in areas where FLS encourage and manage access or where the woodland managed by FLS interacts with popular access routes. Visitor Zones are mapped on [Map 9 – non-motorised path networks & visitor zones](#). In these areas, single trees or small groups of trees will be removed when necessary to protect facilities, infrastructure and trails, or to enhance the setting of features, or to maintain existing views.

Woodland in these zones will be thinned, or trees re-spaced, for safety reasons (*including to increase visibility to ensure that sites are welcoming and feel safe*) and where it is necessary to enhance the experience of the forest setting, through the development of large trees, or preferential removal of trees to favour a particular species.



7.17 Key Woodland Changes 2022-2042

Table 17 – Land use change within forest 2023-2043

Land Use	Area 2023 (ha)	% of Total Plan Area 2023	Area 2033 (ha)	% of Total Plan Area 2033	Area 2043 (ha)	% of Total Plan Area 2043
High Forest ¹	62.17	85.88	64.07	88.51	63.0	88.51
Open	6.80	9.39	6.80	9.39	6.80	9.39
Open Water	0.10	0.14	0.10	0.14	0.10	0.14
Unplantable or bare	0.30	0.41	0.80	1.11	0.80	1.11
Windblow ¹	3.02	4.17	0.62	0.86	0.62	0.86
TOTALS	72.39	100	72.39	100	72.39	100

¹ These components combined make up the forest tree species in Table 18 below

Figure 2 % Land use change within forest 2023-2043

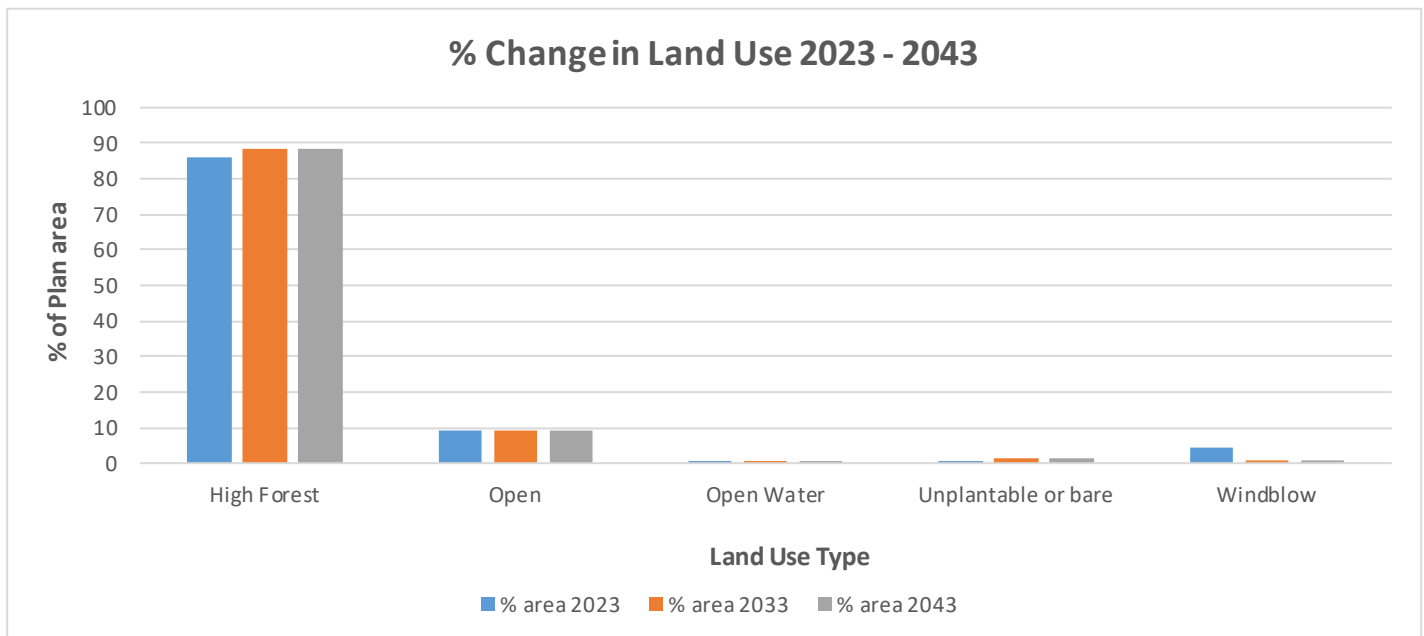


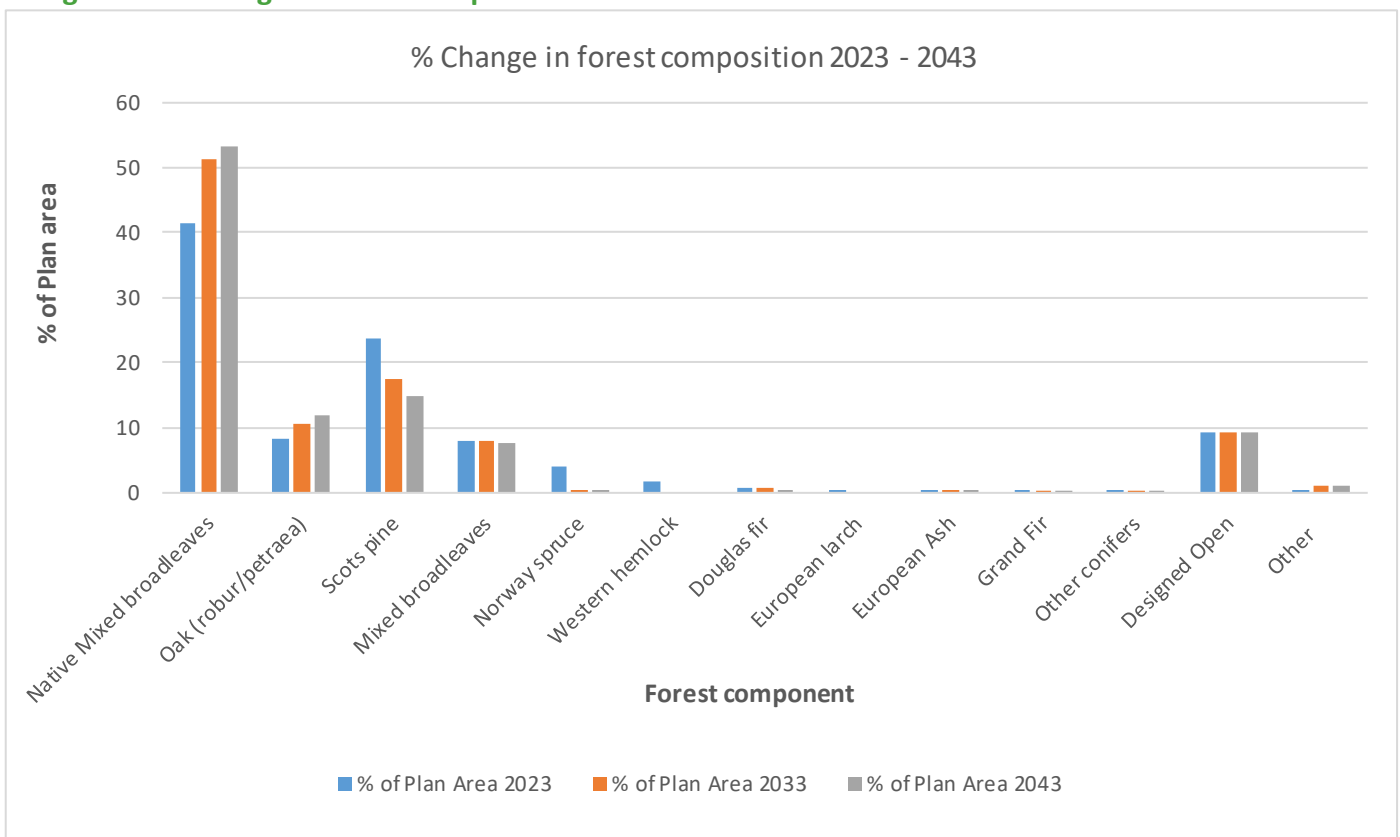


Table 18 Change in forest composition 2023-2043

Forest Component	Area 2023 (ha)	% of Total Plan Area 2023	Area 2033 (ha)	% of Total Plan Area 2033	Area 2043 (ha)	% of Total Plan Area 2043
Native mixed broadleaves	29.93	41.35	37.07	51.21	38.52	53.21
Oak (robur/petraea)	6.10	8.43	7.60	10.50	8.56	11.82
Scots pine	17.19	23.75	12.71	17.56	10.71	14.79
Mixed broadleaves	5.80	8.01	5.70	7.87	5.60	7.74
Norway spruce	3.00	4.14	0.40	0.55	0.30	0.41
Western hemlock	1.30	1.80	0.00	0.00	0.00	0.00
Douglas fir	0.60	0.83	0.51	0.70	0.40	0.55
European larch	0.37	0.51	0.00	0.00	0.00	0.00
European ash	0.30	0.41	0.30	0.41	0.30	0.41
Grand fir	0.30	0.41	0.20	0.28	0.20	0.28
Other conifers	0.30	0.41	0.20	0.28	0.10	0.14
Designed Open	6.80	9.39	6.80	9.39	6.80	9.39
Other*	0.40	0.55	0.90	1.11	0.90	1.11
TOTALS	72.39	100	72.39	100	72.39	100

*Other = open water & unplatable/bare ground

Figure 3 % Change in forest composition 2023-2043



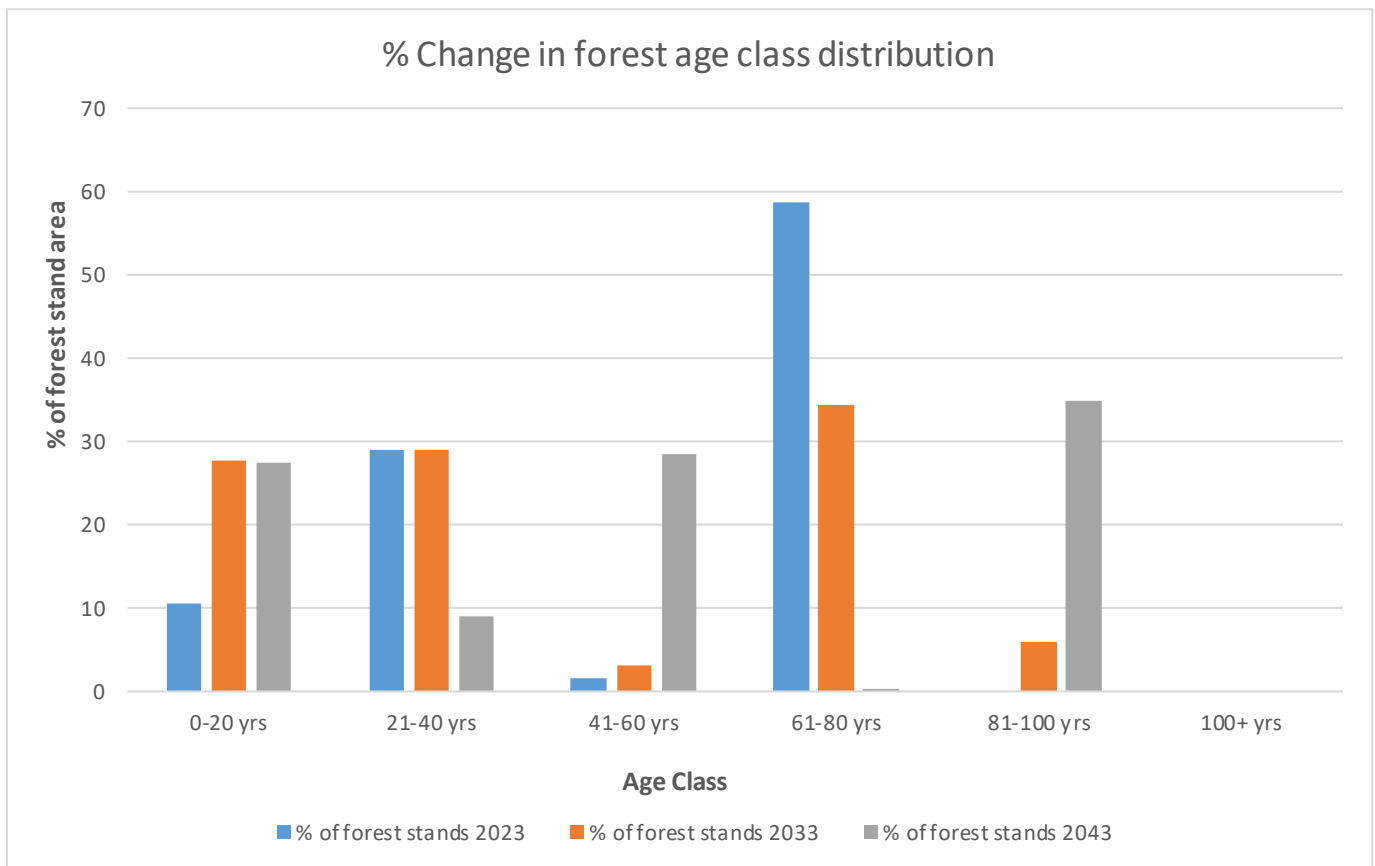
*Other = open water & unplatable/bare ground



Table 19 Change in forest age class distribution of forest stands 2023-2043

Tree Age Class	% of Total Plan Area 2023	% of Total Plan Area 2033	% of Total Plan Area 2043
0-20	10.6	27.6	27.4
21-40	29.1	29.1	9.0
41-60	1.5	3.1	28.4
61-80	58.8	34.3	0.3
81-100	0.0	5.9	34.9
100+	0.0	0.0	0.0
TOTALS	100	100	100

Figure 4 Change in forest age class distribution of forest stands 2023-2043





8.0 Critical Success Factors

The success of this plan will be based on the following:

1. The achievement towards the management objectives set out in [Section 1.2](#).
2. The implementation of operations set out in [Section 2.1 Summary of Planned Operations](#) and [Section 7.0 Long-term management plan proposals](#).
3. Compliance with the UK Forestry Standard and UKWAS guidelines.

[Section 9.0 Table 20 Objective Appraisal, Monitoring & Evaluation](#) (*below*) details how each management objective will be appraised, where and when each objective will be monitored; by whom and where it will be recorded. This will enable an evaluation of success as part of the mid-term and end of term plan reviews.



9.0 Objective, Appraisal, Monitoring & Evaluation

Table 20 (*below*) details how each management objective will be appraised, where and when each objective will be monitored; by who and where it will be recorded. This will enable an evaluation of success as part of the mid and end of plan reviews.

Objective	Assessable Criteria	Appraisal Method	Monitoring Method	Monitor Where	Monitor When	Monitor Who	Record Monitoring Where	Evaluation. <i>How does the Appraisal and Monitoring method inform current & future proposals? If you cannot answer this question then the methods may not be appropriate.</i>
Gradually transform the forest to mainly native broadleaved woodland stands to enhance its contribution to the forest habitat network in Clackmannanshire.	Tree Species composition.	Analysis of change in species composition over plan period. Check levels & composition of conifer regeneration in restock sites.	Site observations. Sub-compartment updates. FLS Stocking Density Assessments (SDA).	LMP files Sub-compartment database.	LMP 5 year mid-term and 10 year review/plan renewal.	Planning team	Planning LMP Mid-term Review. LMP Renewal	The evaluation process will inform planners: If further actions required ensure native broadleaves established. If action required to remove invasive conifers.
Protect and enhance biodiversity assets within the forest.	Protection of identified species and habitats during forest operations. Condition of natural reserve Levels of falling & standing deadwood	Recognition of key features in workplans and operational delivery. Inspect condition of breeding locations, setts, habitats and retained deadwood prior to, during & post-operations. Environment surveys of natural reserve area.	Workplan cross-team operation ¾ completion meetings. Routine site inspections. Periodic surveys	Workplan document. LMP mid-term review and renewal Environment records	Prior to, during and nearing completion of operations and at appropriate intervals e.g. LMP mid-term and 10 year reviews.	Planning team. Programme Manager. Environment team. Delivery teams.	Work plans LMP Files LMP Mid-term Review. LMP Renewal	The evaluation process will inform planners if a review of management is required to protect any of these environmental assets



Objective	Assessable Criteria	Appraisal Method	Monitoring Method	Monitor Where	Monitor When	Monitor Who	Record Monitoring Where	Evaluation. How does the Appraisal and Monitoring method inform current & future proposals? If you cannot answer this question then the methods may not be appropriate.
Protect 'Octagon Wood' designed landscape and incorporate into the forest setting.	Heritage feature condition. and installation of new forest road to LMP prescribed design.	Inspect condition of features prior to, during & post-operations. Planner to check signed workplan prescription for new forest road.	Workplan cross-team operation ¾ completion meetings. Routine site inspections.	Environment records Workplan document. LMP mid-term review and renewal	Prior to, during and nearing completion of operations and at appropriate intervals e.g. LMP mid-term and 10 year reviews.	Planning team. Programme Manager. Environment team. Delivery teams.	Work plans LMP Files LMP Mid-term Review. LMP Renewal	The evaluation process will inform planners if a review of management is required to protect heritage assets.
Manage and mitigate impacts of tree pests and diseases (e.g. Dothistroma Needle Blight and Phytophthora ramorum).	Presence of larch Condition of Scots pine stands Condition of and risk to public safety from diseased Ash	Check for larch natural regeneration in restock sites & isolated trees in mature stands Assess for worsening of DNB in pine stands and deterioration in tree growth. Tree safety inspections	FLS Stocking Density Assessments (SDA). Site observations. Sub-compartment updates. 3 year DNB crop condition survey. Site observations. Pre-sales tarrif (B6) information. Tree safety inspections	Sub-compartment database. LMP files. LMP files LMP files	LMP 5 year mid-term and 10 year review/plan renewal. Annually	Planning team Planning team Stewardship team	Planning LMP Mid-term Review. LMP Renewal LMP Files	The evaluation process will inform: If action required to remove larch. If management proposals for Pine stands should be reviewed. If further action required to remove or make safe Ash areas.



Objective	Assessable Criteria	Appraisal Method	Monitoring Method	Monitor Where	Monitor When	Monitor Who	Record Monitoring Where	Evaluation. How does the Appraisal and Monitoring method inform current & future proposals? If you cannot answer this question then the methods may not be appropriate.
Maintain existing recreational assets throughout the forest and, where feasible, continue to involve relevant stakeholders..	Condition and extent of recreational assets in the forest. Community feedback.	Assess feature condition and safe passage along forest path network. Analyse feedback at plan renewal.	LMP mid-term review & renewal.	LMP mid-term review & renewal.	LMP 5 year mid-term and 10 year review/plan renewal.	Planning team, Visitor services team	LMP 5 year mid-term and 10 year review/plan renewal.	The evaluation process will inform planners if a review of management prescriptions is required to provide greater protection to these features. The evaluation process will inform planners and the visitor services team how and if community involvement, educational activities or other recreational expansion can be delivered within the forest.
Maintain productive management in the west of the forest, focusing on high quality niche broadleaved production in the long-term.	Marketable timber volume output. Thinned conifer & broadleaved stands. Forest composition in productive areas.	Assessment of sales records & product breakout & completion of forest operations proposed in this plan. Assessment of stand characteristics in sub-compartment database: thinning record & stocking density assessment (SDA) Assessment of forest composition change over plan period.	LMP Mid-term review & plan renewal	LMP Mid-term review & plan renewal	LMP 5 year mid-term and 10 year review/plan renewal.	Planning & Programming teams	LMP Mid-term Review. LMP Renewal	The evaluation process will inform planners and delivery teams: 1. If volume output and stand interventions need to be increased or decreased. 2. Where thinning programmes need to be increased or decreased. 3. If further intervention is required to move forest towards lower output hardwood production.
Improve management access to facilitate delivery of the plan.	Road infrastructure installed. Completion of proposed harvesting operations.	Analysis of delivery. Analysis of complaints records for forest.	LMP mid-term review & renewal.	LMP mid-term review and renewal.	LMP 5 year mid-term and 10 year review/plan renewal.	Planning team	Planning LMP Mid-term Review. LMP Renewal	The evaluation process will inform planners if further roading infrastructure is required or if operations need to be planned differently to optimise use of new road infrastructure and minimize third party conflict.